

UNDERSTANDING FOSSILS & EARTH HISTORY



DAVID J. TYLER, EDITOR

**UNDERSTANDING FOSSILS
AND
EARTH HISTORY**

**A
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edited by
David J. Tyler**

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INTRODUCTION

Two contrasting analyses of the phenomenon of creationism have appeared in the journal *Nature*. Marsden¹ sets out to explain why the polarisation between creationists and evolutionists appears to be total. In his view, the real problem is a failure to distinguish between biological and philosophical evolution. Creationists are correct in perceiving that “evolution is sometimes the key mythological element in a philosophy that functions as a virtual religion.” However, according to Marsden, neither of the parties have recognised that the simultaneous rejection of evolutionary philosophy and the acceptance of evolutionary biological theories is compatible with conservative Christianity. This position, which is popularly known as Theistic evolution, has been critically and constructively discussed in “*Creation by evolution?*”, a symposium published in 1983².

This explanation of the observed polarisation is vigorously denied by Jukes³. In his view, the contest is “not a polite discussion of differences in philosophy.” There is no meeting of minds over the idea that evolutionary biology has been absorbed into an “anti-supernaturalistic mythology.” Jukes proceeds to comment on a considerable number of theological and scientific statements made by leading figures in the U.S. creationist movement. He presents creationism as anti-scientific and as a major threat to science education.

The alarming characteristic of Jukes’ paper is the wholly negative analysis it presents of creationism. He is oblivious to the fact that creationists are making a positive contribution to the debate about origins. Furthermore, there is no acknowledgement that Marsden’s observation is justified — many evolutionists are committed to *evolutionism*, and have an essentially atheistic world-view. This symposium issue of *Biblical Creation* is concerned with technical and philosophical issues relevant to the debate about origins. In particular, it focusses its attention on the fossil record and its interpretation. Our concern is to be constructive rather than polemical. Our aim is to instruct and educate rather than to score points. We believe the ideas contained in this symposium deserve more than a superficial response.

The background to Joachim Scheven’s paper is the distinctive associations of rock types and fossils that are commonly observed. Palaeozoic carbonate rocks and their associated faunas, Carboniferous coal beds and some Mesozoic deposits are analysed. Those creationists who advocate a Diluvial interpretation of the rock record have long been challenged to explain how a global flood could leave deposits of such distinctive and diverse characters. Scheven’s paper is a major contribution to this debate. Of critical importance is his discussion of methodology in the historical sciences. To reject traditional

views of uniformitarianism is not to abandon a commitment to having a coherent philosophical base for geologic interpretations. Scheven explains his use of the term “actualism”, and presents his own radical conclusions.

The very title “Biblical Creation Society” expresses the conviction that all understanding of the past must be based on the written revelation of God. Consequently, it is important that creationists are conscientious in their handling of biblical evidences and do not lapse into acceptance of human traditions. In his short paper, David Watts argues that we must not proclaim as God’s truth ideas that are not revealed in Scripture — a principle which must surely commend itself to all Christians! The particular issue raised by Watts concerns the implications of the Fall. The question is not — was the Fall an historical event?; nor is it — did the Fall bring death and decay into the world? Rather, the question concerns the extent to which the Fall brought changes to the diversity of life-forms created by God. It is an important question, and it deserves to be carefully considered.

The Cambrian “explosion” has long been recognised as a major problem for evolutionary models of origins. Christoph Bluth cites numerous writers who have struggled with the problem, and reviews some recent attempts to provide solutions. His conclusion is that the phenomenon remains inexplicable in evolutionary terms. The special pleading which is invoked by evolutionists provides a good case study for Thomas Kuhn’s analysis of scientific activity⁴. Anomalies must be “fitted into” the accepted paradigm — even though this may involve wild and unwarranted speculation. Perhaps it is time for scientists to consider seriously alternative approaches to the problem

The current controversy regarding neoDarwinism and punctuated equilibrium is not considered specifically in this symposium. This is partly because the subject is being well aired in both creationist and evolutionist literature. However, many of the issues relevant to the debate are discussed at some length by Eldredge and Tattersall in their valuable book: “The myths of human evolution”. Their contribution to the debate about evolution in general and human evolution in particular is outlined by David Tyler in his review article. Not only is there much common ground between creationists and the radical advocates of punctuated equilibrium on technical matters, there is also the recognition that sociological and psychological factors have influenced studies of origins far more than scientists like to think. In this field also, Thomas Kuhn’s analysis is demonstrably appropriate.

One of the concluding comments in Tyler’s review article is that the debate about human evolution often focusses on bone morphology to the neglect of the animal considered as a whole. Some appear to forget that bones were once part of living organisms! This point is developed by Gerald Duffet in his

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THE INTERPRETATION OF FOSSILS AND THE PRINCIPLE OF ACTUALISM

Joachim Scheven

1. Analysing the Unknown Past

Fossils point to life in the past. Any statement on fossils beyond the above carries some amount of uncertainty. Is there a way of knowing at what time a now extinct creature was alive? Can we be sure that it once flourished in the same area where its remains are now being uncovered? Should we regard it as representing a certain stage in an evolutionary history of life on this Earth, or rather as representing one member of a certain habitat that at one time co-existed with others? Or, did we perhaps overlook some vital significance of our fossil altogether?

The fossils are silent about themselves. All we may learn about former habitats and peculiar modes of life must be inferred from comparisons with life forms and environments now existing. The present is truly the key to the past, but this past will not reveal itself unless the key is tried in the right keyhole.

The correct interpretation of fossils depends in a large measure on a comprehensive knowledge of taxonomy, an understanding of ecological interrelations, and an insight into the conditions imposed on organisms or life communities by the laws of physics. Only if a sufficient amount of this information is collected and adequately employed, will the fossils yield their secrets and permit realistic vistas into the Earth's past.

The principle of Actualism proceeds from data that are actually observable and whose interpretation is sure. Proceeding by this rule should lead to reliable concepts about origins. In other words, it should be possible in compliance with actualistic precepts to decide by observation and reasoning whether the Earth we inhabit is young or ancient, and equally, whether we are the product of evolution or not. If the principle of Actualism can really accomplish this, one may ask, why is it that conflicting views on origins exist?

The answer is that all scientific judgement includes, in part, personal views about the origin and destiny of ourselves, which introduces thereby an element of free will decision. Not even the purest intellectual approach to an unsolved scientific problem can eliminate pre-existing convictions about it unless the whole person consents to it, that is to say, changes his mind. And with the two options of creation or evolution this is a matter of grave importance.

If we define scientific truth as the paradigm that offers the least number of contradictions among the facts of a given set, such a view of things will come closest to the ultimate truth about origins which men embrace or reject. Where and whenever different interpretations compete the principle of Actualism is going to act as the impartial judge. Of the two conflicting paradigms in Paleontology only one can be right and it ought to be possible to arrive, independently of any majority claim, at the right one.

The term Actualism is sometimes reduced to simply meaning the idea of a uniformly slow pace of all geological processes since the beginning. This philosophy is known as Uniformitarianism and thrives, of course, on the belief in an evolutionary rise of all living things. Since it is by the principle of Actualism that catastrophies are deciphered from the rocks and the perfection of extinct organisms is confirmed, we should beware of the uniformitarian attitude in interpreting the fossil record which tends to obscure obvious facts of Earth History and to mislead the scientist.

2. The Enigmatic Marine Paleozoic

The rocks of the Paleozoic comprise a series of fossiliferous strata that, in certain areas, overly the barren igneous or sedimentary skin of our globe. Palaeozoic fossils are therefore, in ascending order, the earliest preserved life forms on Earth. Can it be said with assurance that they also represent their evolutionary beginning?

The most remarkable fact about fossils is that they exist. Under normal conditions, the substance of dead organisms becomes subject to a process of re-conversion into inorganic matter after which practically nothing of their original structure remains. Fallen leaves are turned into soil without an increase of the humus contents in the forest floor. Recent seashells slowly dissolve and erode away but are not normally added to the fossil record. From reasoning on actualistic lines, the entire marine Paleozoic can only have been the result of a violent disruption of the normal processes of re-cycling as described by the carbon or nitrogen cycles.

Whereas some of the obvious facts about fossils hardly receive the attention they deserve, certain characters whose interpretation is not really straightforward seem to be taken for granted. One example are the eyes of trilobites. Trilobites have long been held to be ancestral to all modern aquatic and land-living arthropods. The peculiar uniformity of a veritable host of species suggests, however, that in all likelihood their original abode was not a surface ocean at all. Blind species are known among genera otherwise well equipped with compound eyes. Where functional light sense organs exist they are marvels of optics, but, in contradistinction to recent water arthropods the

blind trilobites seem to have flourished together with their regular cousins in the same habitats. Thus, the radiation received by trilobite eyes can hardly have meant the same to them as sunlight does to modern crustaceans and water insects.

On closer inspection the compound eyes of trilobites differ vastly from the rest of arthropods. The astonishing fact about them is the use of calcite as the light-refracting material with a refractive index far in excess of that of organic chitin, the material from which the lenses of other arthropods are made. The thickness and sphericity of these lenses, too, are unusual. It can therefore be suspected that these organs were not processing sunlight at all but responded to another ray type, possibly to “invisible” infra-red radiation. This is particularly suggested by the higher refractive index of the thick lenses not met with in other creatures with comparable eyes. It is possible that the original habitats of trilobites are to be sought in vast lightless subterranean water basins in the deeper parts of the lithosphere which, following a temporary instability of the Earth’s crust, lost their water with its faunal contents to the surface. A singular geological event of this type is recorded in the Biblical account of the Flood. A theory based on this Flood would at once explain the good state of preservation of many Paleozoic fossils and the striking lack of re-cycling. Such subterranean seas could have been stable only under complete seclusion from above which would automatically imply that the trilobite faunas of the closed caverns of the deep cannot have evolved from surface dwellers but must have been created separately. This hypothesis is of course unacceptable for the adherent of an evolutionary philosophy.

There is yet another clue suggesting that trilobites were really thrown up from the “fountains of the great deep” as the Bible calls them. A good many of them can be found in more or less close association with skeleton-building stromatoporids and tabulate corals that abound in certain Paleozoic deposits. The dense skeletal lumps exhibit a characteristic pattern of cracks so commonly that this may be the reason why no one seems to have studied them previously (Fig. 1). The cracks cross the solid disks and domes in such a manner as to exclude their derivation from pressure through the overburden. The cracks are well developed where the skeleton is thickest. Small colonies tend to remain intact but any larger specimen will invariably be found to be affected. What is the explanation for this? If the solid skeletons lived originally in the fountains of the great deep they must have grown up under tremendous pressure. It is then reasonable to assume that the internal stresses within the skeleton, that balanced the extreme water pressure during life, should have caused some visible deformations after this pressure was suddenly released.



Fig. 1 Underside of a Devonian stromatoporid from the Eifel highlands, Gerolstein, Germany. The cracks are best developed where the skeletons are thickest.

If the marine Paleozoic is viewed as having welled up from the deep within a very short time, the spread and buildup of stratified “reefal” limestone over sometimes large areas finds its most natural explanation. The alleged “reefs” of the Silurian and Devonian have, on closer inspection, turned out to be the compacted jumble of separate colonies which, although frequently overgrowing each other, were usually living after the fashion of the recent coral *Fungia* and were definitely not forming large coherent autochthonous masses. In accordance with this, the “crog balls” or “ballstones” of the Dudley lime quarries and the corresponding structures in the Silurian of Gothland are agglomerations of skeletal organisms which have obviously already been moved about as a whole and do not represent reefs in the strict sense.

Once this opening up of the fountains of the great deep is recognised as the beginning of a whole chain of geologic events, the “marine” Paleozoic must necessarily be the initial and lowermost sequence of all fossil-bearing strata. Then also the occurrences of identical fossils in very distant Paleozoic outcrops cease to pose biogeographical problems. What appears to be an orderly stratigraphic succession in the fossil record of the Paleozoic may well be accounted for by the sorting effects of water. In the complete absence of Paleozoic cliffs, caves, undisputed hardgrounds, and — as already mentioned — genuine reefs, the idea of an early stage in the evolution of marine life on Earth has lost its credibility altogether.

3. Geologic Time — Gliding Away With The Coal Forests

The currently prevalent interpretation of fossils in terms of evolution is based on the conviction that many millions of years of geologic time have run their course. Many scientists, although critical of evolution, have nevertheless settled down with this paradigm because they feel that the ages of Geology cannot be disputed. Despite a seemingly well-documented rise of organic life, and even in the face of the famed *Archaeopteryx*, the idea of evolution would hardly have become so entrenched in the minds of people if it was not for the time background of Historical Geology that calls for some meaning.

The idea of the geologic ages received its strongest impetus when, in the first place of the last century, a small number of experts asserted that the seams of the Coal Measures were actually resting on genuine ancient soils. The implication is easy to grasp. If the accumulated carbon of one coal seam is the product of many thousand years of forest growth, the many superimposed seams of a normal coal field, combined with the time necessary for deposition of the intervening rocks, would add up to a period of hundred thousands or millions of years. This enormous time, if real, could not be demonstrated more easily than by totalling the lifetimes of the succesively flourishing forest generation — provided the *in-situ* growth of the coal vegetation can be established.

Charles Lyell related in his “Travels in North America”, vol. 2, how eagerly he had anticipated seeing the famous fossil tree trunks exposed along the Joggins Coast of Nova Scotia (Fig. 2).

“I was particularly desirous, before I left England, of examining the numerous fossil trees alluded to by Dr. Gesner as imbedded in an upright posture at many different levels in the cliffs of the South Joggins, near Minudie. . . I felt convinced that, if I could verify the accounts of which I had read, of the superposition of so many different tiers of trees, each representing forests which grew in succession on the same area, one above the other; and if I could prove at the same time their connection with seams of coal, it would go farther than any facts yet recorded to confirm the theory that coal in general is derived from vegetables produced on the spots where the carbonaceous matter is now stored up in the earth.”

Lyell had been out to convince himself of the autochthonous nature of the upright scale trees of Nova Scotia and none of the numerous observations pointing directly to the opposite could prevent him from returning as one completely confirmed in his already adopted belief. In a sense, the Joggins Coast may be regarded as something like “the cradle of Darwinism” for here it

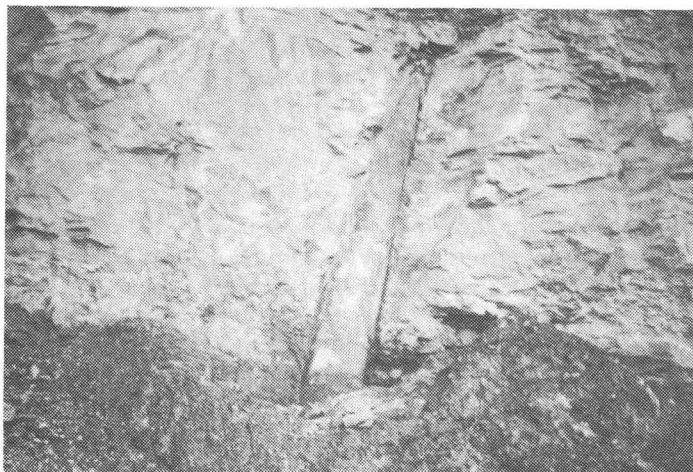


Fig. 2 One of the upright trees exposed along the Joggins Coast, Nova Scotia, Canada. In a sense, the Joggins Coast may be regarded as something like “the cradle of Darwinism”.

was that Lyell imagined himself to have gained his most irrefutable proof for the eons of Earth History upon which Darwin was going to build his theory afterwards.

The remoteness of that shore may be the reason why the frequently tapering or enlarging sand and shale beds and the dramatic washouts seen anywhere for miles have not received adequate attention by sedimentologists, and why the striking difference between rock types inside and around the hollow stems has been ignored with respect to its significance for time estimates on coal measures sedimentation. There is really nothing to suggest a slow buildup of sediment or a long-term forest growth. Stigmarian roots in current-bedded sandstone, quickly concealed footprints of reptiles, besides the already mentioned bedding features and other surprises like an upright stem base in the middle of a washout, as recorded by the writer in 1981, are unmistakable evidence for a fast subsidence of the entire area and the catastrophic burial of the trees.

These giant clubmoss trees seem to have been generally misinterpreted by geologists. The solid stems exposed in Nova Scotia, in the Fossil Grove of Glasgow (Fig. 3), and elsewhere are by no means petrified wood but ordinary sand or shale having been injected from above into stems and roots which were hollow from the beginning. The common text-book version that the interior of the stems had to rot away first before replacement with sediment could take place is simply not true. Besides a thin conducting cylinder and its

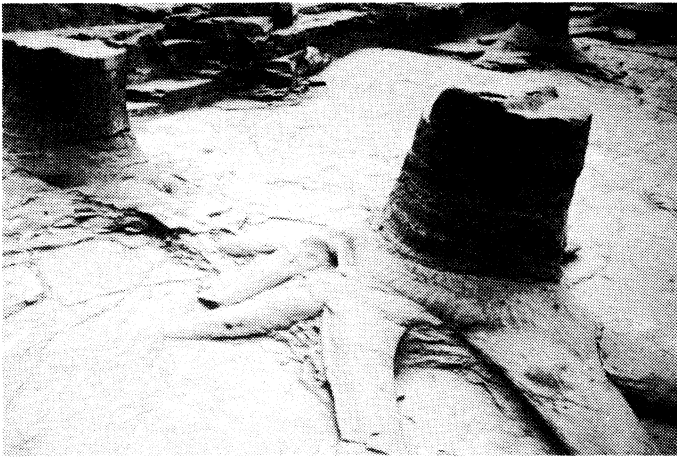


Fig. 3 Casts of hollow scale tree stumps in the Fossil Grove, Victoria Park, Glasgow. These giant clubmoss trees seem to have been generally misinterpreted by geologists.

communicating tissues to the cortex of growing branches the stems and roots contained essentially air. A vegetation of this type was obviously light-weighted and therefore suited to floating.

The roots of the scale trees commonly found immediately below coal seams are called *Stigmaria* because they are dotted with scar-like marks. Again, these marks and the adhering secondary roots have never received the comment they deserve. Three outstanding facts may be mentioned. Firstly, the stigmarian marks surround the cylindrical roots on all sides by sending the secondary roots (or appendices) not only downwards but also sideways and upwards. No living plant growing on firm soil exhibits a root arrangement like that. Secondly, the marks are scars of abscission which means that the secondary roots were shed after the manner of leaves. In soil such behaviour of roots would be useless. Thirdly, the appendices, too, were hollow. A growing root of this kind is unlikely to force its way through a compact substrate like sand or clay. The stigmarian root systems were therefore unquestionably adapted to a life in water.

This conclusion is fully borne out by observations on underclays and coal ball sections. In underclays the deflated appendices are invariably surrounded by an undisturbed sediment so that the once free-spreading lamp brush-like structures can only have become embedded posthumously. Coal ball sections reveal that during lifetime much of the coal-forming peat was composed of a tight fabric of inflated appendices squeezing themselves into every available niche of decaying plant matter (Fig. 4). This must have lent a considerable

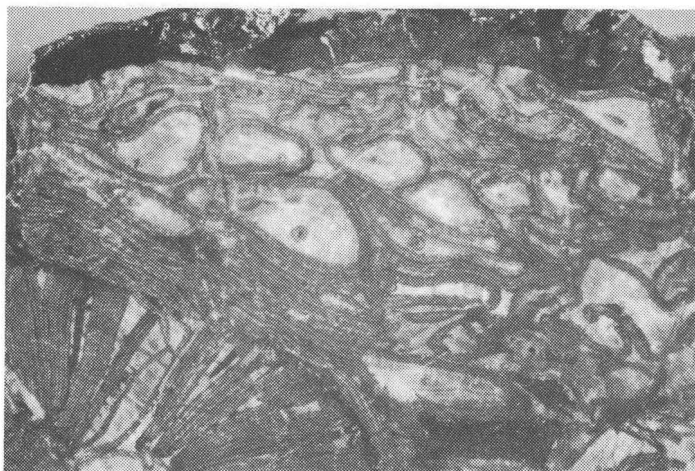


Fig. 4 Petrified Carboniferous peat inside a coal ball from Illinois, USA. The coal-forming peat was composed of a tight fabric of inflated appendices squeezing themselves into every available niche of decaying plant matter.

buoyancy to the entire mat, well able to support the towering vegetation overhead.

These details, and more besides, seem to have been either overlooked or taken lightly by those working on coal under the paradigm of geologic time. Unwilling to acknowledge that the coal forests were swiftly transported into their present positions underground, they are driven to the most unfruitful hypothesis in order to account for their origin. Simple actuo-paleontological experiments can demonstrate that no living plant will indiscriminately tolerate clay, pure sand, lime, or organic mud, any of which the stigmarian roots may be found “growing” in. Likewise, no present-day sediment will look as if just deposited after having already supported vegetation for a thousand years as claimed for the underclays of coal seams.

Under the paradigm of a “Coal Age”, there is evidently no actualistic mechanism available to account for the necessarily rapid subsidence of coal basins. Long-term processes in the Earth’s crust or extra-terrestrial influences are invoked to explain the strange superposition of coal seams somehow. Returning however to the Flood paradigm, and recalling that the marine Paleozoic could have originated from created water reservoirs deep down in the Earth, the emptying caverns would have initiated a relatively quick subsiding of the surface and provided synclinal troughs into which the floating coal forests could glide. Once it is grasped that there is only one mechanism for burying floating vegetation, namely by rapid displacement and nothing

else, the various concepts to explain the storey-wise deposition of Carboniferous coal tied up with an evolutionary frame of Earth History can only be rejected. In other words, the whole idea of a “Coal Age” must be dismissed.

A word may be added on the formation of brown coal. The numerous upright tree stumps of conifers in the Rhenanian lignite near Cologne have been conventionally regarded as proof for the autochthonous growth of such Tertiary forests. By digging up these stumps the question has been investigated if they are still connected to a root disk and anchored in the lignite as in true forest soil. It has been found that, contrary to common belief, the roots are worn away or, at best, form short projections which have helped them in keeping their upright posture. The stumps have definitely not grown in place. How then can this enormous accumulation of plant matter be explained? The lignite deposits of the Bay of Cologne are situated where the primeval estuary of the Rhine issued into the ancient North Sea at one time. It can be demonstrated by an experiment that wood floating on sea water for some time will sink to the bottom if the brine is superimposed by fresh water. If this condition obtained in the Bay of Cologne, and there is little doubt that it did, the layered deposits of brown coal, with their stumps sunk vertically to the ground, have found a simple explanation if it is conceded — under the Flood paradigm — that vast carpets of uprooted “modern type” vegetation must have been covering the post-diluvian seas. Under the paradigm of geologic ages, on the other hand, it would be hard to invent a theory by which to make intelligible the origin of this unique amount of drifted vegetable matter. Darwin’s “abominable mystery” — the sudden appearance of the “modern type” vegetation in the fossil record — is solved at once if the devastating effect of the Flood and a re-afforestation of the Earth, in step with ecological necessities, is seriously taken into consideration. The two million years claimed to have been necessary for the accumulation of the Rhenanian lignite have vanished into non-existence in any case.

4. German Muschelkalk — One of the Transient Ecosystems after the Flood

Much of the paleontological research of the last two decades has been devoted to the study of trace fossils, hardgrounds, and reefal structures. The more of these come to light — it is reasoned — the more forcefully will the time concept of a Hutton-Lyellian uniformitarianism be vindicated. This would appear to be true. But how much geologic time is actually gained?

In this context we will disregard trace fossils, which are witnesses to rapid burial *par excellence*, and confine ourselves to one outstanding example, the static periods during the deposition of the German Muschelkalk.

In 1913, Georg Wagner drew attention to accretions of a tiny shell, *Placunopsis ostracina*, which are found in the Upper Muschelkalk of Southern Germany. The *Placunopsis* shells are sessile and cemented by one valve to a hard surface. If this surface happens to be another fixed valve of a dead *Placunopsis* and if many shell generations accumulate on each other, voluminous knolls or lenses are developing as a result. On sectioning such lumps of *Placunopsis*, Wagner found about 25 shells per centimetre, or 2500 shells across one metre of a *Placunopsis* “reef”. He reckoned that an individual shell would live through about five years. It is obvious that, once the life span of a single shell generation is known, the accumulation rate of the limestone deposits surrounding a growing shell reef can be calculated. Georg Wagner realised the utility of this strictly quantitative method for time estimates in Historical Geology and — equating 1 m *Placunopsis* growth with 12,500 years and assuming double the time for the accumulation of one metre limestone — he came up with a duration of about 2 million years for the deposition of the Upper Muschelkalk.

The bivalve *Placunopsis* is completely extinct and its precise ecological requirements regarding temperature and water chemistry are not known. From analogy with oyster spat, however, thus much can be stated that for the increase of one *Placunopsis* larva to an individual of colony size four weeks are fully sufficient. This brings Wagner’s time estimates about *Placunopsis* already down to one thirtieth.

Another fact about *Placunopsis* reefs which has never been candidly admitted is that the largest colonies were not attached to a surface. In sections it can be easily demonstrated that they were growing downwards just as well as upwards. Having thus increased in both directions simultaneously the growing time of such a globular or lens-shaped colony must be further reduced to about one half, i.e. one sixtieth in all. This means that a “reef” of supposedly 12,500 years would have developed within only 208 years. Reef bodies which are actually movable cannot, of course, be brought into relation to the accumulation rate of the surrounding limestone because they had their history obviously elsewhere and were merely transported to their ultimate location. The time estimate of 2 million years for the deposition of the Upper Muschelkalk is therefore completely unrealistic.

Further information on the true growth rate of *Placunopsis* masses is afforded by another reef type. In a few horizons, *Placunopsis* colonies appear as genuine overgrowths on true hardgrounds (Fig. 5). In a quarry near Crailsheim, the thickest reefs, attaining about 8cms, follow the course of large ripple marks with about 1 metre wavelength and can be traced particularly in one horizon over an area of some hundred metres across. A conventional interpretation of these "ripple reefs" would be this: Millions of mobile *Placunopsis* larvae arrived with a current and were washed to the crests of ripples where they attached themselves immediately. Then, 1000 years later, after the reef had grown to the height of 8 cms, the whole surface was buried under the debris of a new "storm event". Of course, there is something palpably wrong with such interpretation. Which uniformitarian mechanism could be adduced to provide for the one thousand years of tranquil water for practically nothing than *Placunopsis* to grow in? And what agency could have hindered the offspring to occupy the empty valleys in between the crests if they had seriously the time of 1000 years to expand? The only answer is that this time didn't exist. Incredible, though it may sound, the evidence requires us to envisage a creature that, under very special conditions, lived, spawned, and died within mere days. Whatever the conditions may have been, they have disappeared with the termination of the Muschelkalk; so, too, have the *Placunopsis* shells and the entire shallow sea community of the "Triassic".

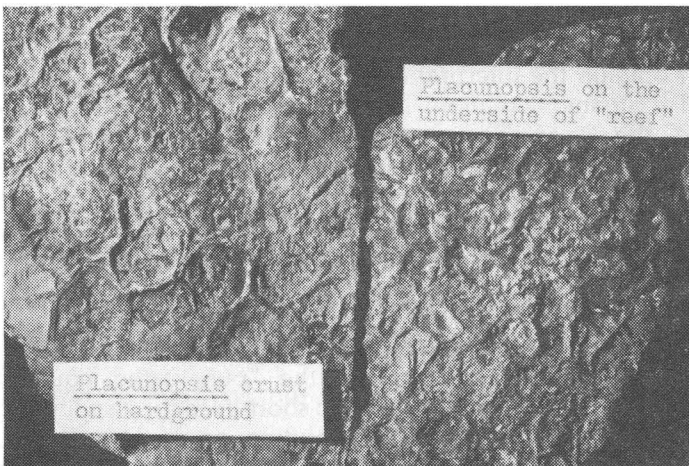


Fig. 5 The sessile oyster-like clam *Placunopsis* from the German Muschelkalk. One fact about *Placunopsis* that has never been candidly admitted is that they were growing downwards just as well as upwards.

The overgrowth of *Placunopsis* on ammonite shells and hardgrounds as well as the transported lenses mentioned above exhibit a tumor-like pathological character. Solitary *Placunopsis* shells may reach as much as 5 cm in diameter but colonial ones grow barely above 10 mm. Everything about them suggests an abnormal behaviour. The intensely monotonous fauna of the Muschelkalk sea that is mostly composed of filtering organisms (bivalves, lampshells, and crinoids) is reminiscent of badly disturbed ecosystems of today where population explosions of certain species are one of the visible results. The vast quantities of crinoid ossicles and densely packed layers of molluscan valves and brachiopods, unparalleled in modern seas, must have originated from such mass propagation in a disturbed ecology as yet far away from a stable climax. Thus, the Muschelkalk sea can be viewed as a huge body of marine debris in the wake of the Noachian Flood. What an adherent of the geologic ages would consider to have been a major episode in Earth History may be more readily described as one of the transient stages of a post-Flood mega-succession. Under the paradigm of a totally Flood-devastated Earth, the epicontinental seas of the Mesozoic and early Cenozoic can be regarded as mere stations in the re-arrangement and re-settlement of marine life in the biosphere of this world. Judging from hardgrounds and occasional reefal growth it is unnecessary to assume more than a few decades for each. Ecological successions on a global scale are of course singular phenomena and cannot be studied under controlled conditions.

5. The Perfection of Fossil Organisms

In popular opinion the interpretation of fossils is intimately connected with evidence for organic evolution. The preponderance of invertebrates in the "Paleozoic", the rise and decline of certain reptiles in the "Mesozoic", and the appearance of Man in the late "Cenozoic" seem to suggest an evolutionary sequence. But as we have seen already, those eras of Earth History and their subdivisions are indeed better interpreted as entire life communities that perished with the Flood. Many students of fossils have noted that the evidence in favour of evolution is in fact totally missing.

An attempt has been made lately to whitewash the universal absence of connecting links with the theory of the "punctuated equilibria". The intermediate forms, it is claimed, were too short-lived for standing a chance of getting preserved. The real "hits" of evolution, on the other hand, made it through hundred thousands of years and, consequently, are the ones that compose our fossil record. Seeing that none of the fossilised creatures are less perfect than the living, connecting misfits are postulated that are unpreservable by definition.

The principle of Actualism proceeds from positive evidence. The punctuated equilibrium theory proceeds from assuming the existence of “imbalanced intermediates” that are entirely unknown.

One notion about fossils is that they represent forms which are all extinct. A small number of “living fossils” is reluctantly conceded but otherwise the living fauna and flora is regarded as the changed descendants of populations of bygone ages and the product of a most recent development. This view is quite unjustified. Of course, we should not expect to come across living representatives of species whose proper habitats have disappeared, nor try to find fossil members of living species in strata that, according to the principle of Actualism, cannot contain them. But there is a large and steadily growing number of fossil genera (kinds, or organisational entities) that are truly identical with the living. A great many species of amber insects can be immediately assigned to present-day genera. The recognition of living forms on a level corresponding to current definitions of “species” among the amber faunae is admittedly difficult. This is due to the very imperfect knowledge of the world’s insects in the range of 1-5 mm, among which vast numbers of tropical forest dwellers remain to be discovered. Really common or ubiquitous species, however, such as the house fly *Fannia scalaris* and the dwarf millipede *Polyxenus lagurus*, among others, have been directly matched to specimens supposedly 40 million years old.

Among the many vertebrates of the oil shale pit of Messel in Germany whose officially assigned age is 50 — 60 million years the remains of three freshwater turtles, *Ocadia*, *Trionyx*, and *Anosteira* (all but the second now being re-named!) resemble living members of their kin most closely and are practically indistinguishable. The recent turtle genus *Podocnemis* is recorded, geologically speaking, as far back as the Cretaceous and would therefore, by orthodox standards of Historical Geology, be 100 million years old. But the fine specimen exhibited in the Field Museum, Chicago, is an unmistakable *Podocnemis* and by no means a “fore-runner”. Another extraordinary example of specific identity is the seasonal crustacean *Triops cancriformis*. Hundreds of specimens were discovered in petrified puddles of the Triassic sandstone plains of Southern Germany in the thirties of this century and a few more in the Bunter of the Alsace. Under the paradigm of evolutionary Earth History they would have lived through at least 200 million years without the slightest change (Fig. 6).

To repeat, there is not the least reason to suppose that any of these forms were preceded by “primitive ancestors”. As far as the fossil record goes the first turtle was just that, and so were the first prawn, the first spiny lobster, the first mosquito, and the first flea. The actualistic interpretation of the fossil record is therefore one of perfection leaving no room for improvements whatsoever. This state of affairs is still best described by the term Creation.

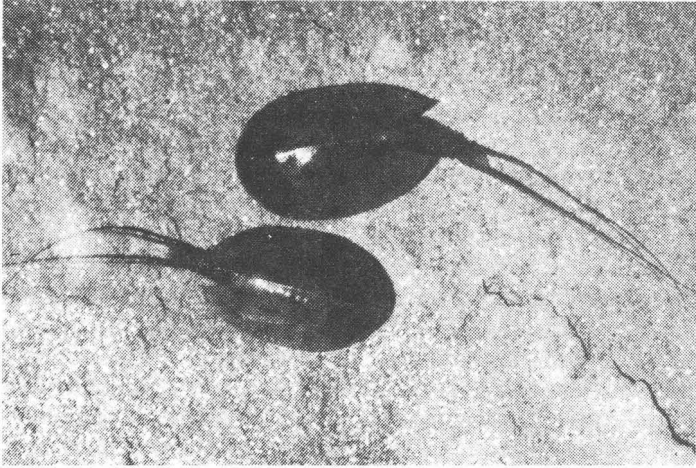


Fig. 6 *Triops cancriformis*, a seasonal freshwater crustacean. Hundreds of fossil specimens of this species were discovered in petrified puddles of the Triassic, supposedly 200 million years old.

6. Actualism Means Honesty to the Facts

Most of the processes having led to the formation of fossils are not really understood in their natural setting. Cocquinas of trilobite tests whose organic matter ought to have decayed soon after death are not matched by buried accumulations of living crabs or xiphosurids. Similar layers of recent arthropods could be reasonably expected if trilobites had actually died in a natural way in ancient seas of the Earth's surface.

Nor does the time factor explain away the genuine difficulties attending the interpretation of the fossil record. The formation of coal for instance, as simulated in the laboratory, is completely independent from "geologic time" and cannot, therefore, have contributed to the enigmatic induration of plant matter nowhere observed on our Earth today. And chains of air bubbles literally "frozen" in amber testify to the extremely quick setting process of the liquid gum, and in this case too, the conventional millions of years need not be invoked (Fig. 7).

As stated before, the most surprising fact about fossils is their existence. An Actualism that is rightly applied would therefore candidly admit the catastrophic origin of fossil-bearing rock formations. To give a final example, all attempts of referring the origin of the Solnhofen limestone to recent sedimentation going on at the Bahamas or in the Persian Gulf have failed and

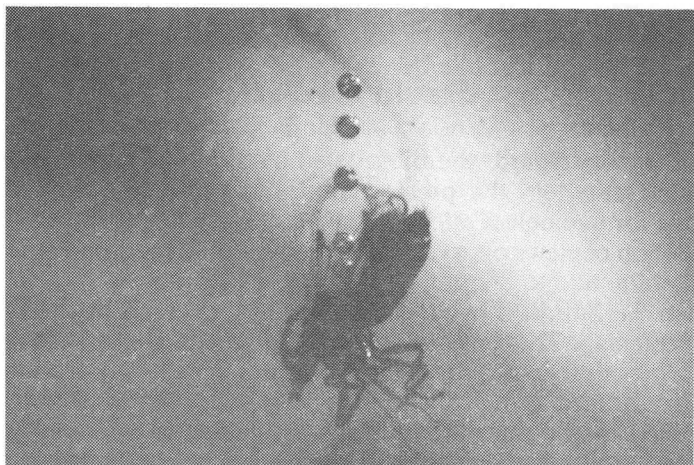


Fig. 7 A chain of air bubbles literally “frozen” in Dominican amber. For the setting process of this fossil gum the conventional millions of years need not be invoked.

produced at best vague analogies unsuited to explain the mixed assemblage of marine and air-borne life forms contained in this limestone. Likewise, the Messel oil shales with their numerous mammals, alligators, fishes, turtles, birds, and bats with faunal affinities to almost all continents have not even remotely a recent freshwater body to compare with. Led by the principle of Actualism we are compelled to look beyond the boundaries of the oftentimes repeated and reproducible processes reflected in everyday experience and to think out situations that enable us to interpret the fossil record satisfactorily. A strictly actualistic approach to Earth History will necessarily arrive at a series of unique events that are squarely opposed to the idle persuasions of uniformitarian geology. Such events can indeed be related to the Noachian Flood and its after-effects (and, in a few instances, to the formational period of the Earth, i.e. the Third Day of Creation — not touching in such cases, of course, the interpretation of fossils).

The actualistic approach to the fossil record leads inevitably to the conclusion that species, both fossil and living, are at the most polymorphic in outer appearance but in no case ascending through a series of undefinable transitional stages as claimed by the evolutionary school of thought. This insight amounts to an acknowledgement of the creation of distinct Genesis kinds altogether apart from the geologic age concept. The interpretation of fossils in accordance with the principle of Actualism leads ultimately straight to Creation and Catastrophy. The statement of an ancient scientist aptly summarises the effect of departing from the testable evidences: “God hath made man upright; but they have sought out many inventions.” (Eccl. 7:29).

FOSSILS AND THE FALL

David C. Watts

The Christian who regards the Bible as an inerrant and supreme authority¹ must seek to ascertain the precise consequences of the Fall so that the implications for geological science may be consistently followed through in the formulation of views on rock strata, fossils etc. At the same time, we must be careful not to add to Scripture, for example by pressing the interpretation of e.g. Rom. 5:12, 8:20ff beyond the meaning intended by the Divine and human authorship. That is to say we must go as far as, but not necessarily further than Scripture requires us to go. Individually we are at liberty to impose upon ourselves the constraints of a system of earth history which is a more detailed model than the bare text of Scripture *necessarily* requires. However, we are only warranted to demand of *other* Christians that they submit to those facts and considerations which Scripture unequivocally requires us to accept. To refuse to submit to the unequivocal demands of Scripture is a form of 'antinomianism'. To make demands which go beyond Scripture is a type of 'legalism'. We need the freedom of slavery to Christ alone in Creationism as well as in other departments of the Christian life and fellowship.

It is evident that the distinguishing of those factors which Scripture specifies as unequivocally consequences of the Fall from those which are not will require careful examination of the text of Scripture. Protestants have generally recognised the role of historical, linguistic and theological factors in the exegesis of the Biblical texts.¹ In the texts in question, our understanding of the *precise* meaning of the author may hang on the precise meaning of a Greek or Hebrew word or phrase, e.g. *phthora* in Rom. 8:21. Often, however, the general sense of a passage may be sufficient for our purposes. Nevertheless when it comes to the exact consequences of the Fall, Scripture is precise on some aspects but (arguably) imprecise on others. In particular, it is emphasized that human death (in every sense) is a consequence of the Fall alone², (Rom. 5:12ff; 1 Cor. 15:21f). The question of animal death however is *not* handled by Scripture in quite such specific and explicit terms. Doubtless the Lord could have specified this issue with greater precision, but (arguably) He has not chosen to do so. The undoubted reference of Romans 8:21f to animal suffering as a consequence of the Fall does not settle all aspects of the question of the origins of animal death³. If this be so, the issue of possible pre-Fall death of some animal life-forms is an open question. On such a basis it may be possible to envisage some pre-Fall fossilization of animal remains. The deductions made tentatively in the last two sentences may require an 'open'

view on the time-span envisaged in Genesis 1. If the Creation time-span should have been short then it may have been too short for actual pre-Fall fossilization. Surely, however, possible pre-Fall fossilization of *some* animal remains will be admitted a reasonable inference drawn from the tentative premises of (a) some pre-Fall animal death and (b) moderate or longer time-spans within the Creation epoch of Genesis 1. (For the sake of clarity in debate we must distinguish denial or acceptance of the two foregoing premises from denial or acceptance of the foregoing inference).

Even on the strictest possible view of animal death — as being entirely post-Fall, and the strictest (youngest) view of the age of the earth, all that we can infer from this revised set of premises is that all animal fossilization is post-Adamic. We are not *required* by these premises to infer that fossils are totally or predominantly Noahican in age. This is a significant point, for even on the 'tightest' view of the Genesis 5 genealogies, a period of at least 1,656 years elapsed between the Fall and the Flood. (Morris and Whitcomb⁴ suggest a time span of up to 5000 years for the 'symmetrical' genealogy of Genesis 11). This period is therefore, on Scriptural grounds alone, a possible era of fossilization to be considered along with the Deluge year and the post-Flood era. On a 'minimal' view therefore the Christian geologist is "theologically" entitled to 'date' fossiliferous rock strata at any point within the entire post-Adamic era. On a 'maximal' view he is additionally entitled to date some fossiliferous strata (containing more lowly life forms?) within the pre-Adamic creation epoch of Genesis 1.

On Scriptural grounds alone, therefore, the '100%' Flood-Geology theory (as classically formulated by Morris and Whitcomb) is not the only view to legitimately claim the attention of Christian geologists. Such a view holds that virtually all fossilization is to be attributed to causes acting within a one-year period. This is perfectly acceptable as a possible model. Our criticism is directed against the promulgation of this view as THE model, with all others being regard — by implication or otherwise — as "theologically" dubious or "unscriptural". When however we begin to combine our biblical data with scientific principles, then some view (e.g. various flood-geology models) may appeal as more 'reasonable' than others. We should therefore clearly distinguish between such *preferences*, as based on 'Scripture plus science', from the wider range of possible models which God, through Holy Scripture, allows us to explore in reverent submission to His revealed counsels.

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THE ORIGIN OF INVERTEBRATE LIFE IN THE PRECAMBRIAN: AN IMPASSE IN EVOLUTIONARY THEORY

Christoph Bluth

In order to achieve a satisfactory description of the origin of life in the great multitude of forms that we encounter today, evolutionary theory also needs to account for the origin of life from non-living matter, and the evolution from unicellular living entities to the kind of invertebrate life that we find in early Cambrian formations. Most evolutionists would admit that the description of chemical evolution is far from satisfactory, and the implausibility of various scenarios of chemical evolution has been thoroughly demonstrated.¹ At this point we would like to review the situation with respect to the next stage: The origin of invertebrate life in the Precambrian.

The origin of the protozoa

The protozoa are often divided into four classes:

- (1) The mastigophora (flagellata)
- (2) The rhizopoda (amoeba)
- (3) The sporozoa
- (4) The ciliata

Which of these classes is the simplest, and how are they related in an evolutionary sequence?

At this point the most fundamental distinction is between 'prokaryote' and 'eukaryotes'. The prokaryotes (which include the bacteria and blue-green algae) have no nucleus, i.e. they lack the membranes that separate nucleus and enzymes. In prokaryotes the DNA appears in the form of a single ring-shaped chromosome with few associated proteins. Prokaryotes do not contain any mitochondria, and cell division does not occur by mitosis as in eukaryotes. Furthermore prokaryotes lack the chloroplasts necessary for photosynthesis. In contrast eukaryotes (which include other protozoa, green algae and all higher plants and animals) feature a nucleus which is separated from the rest of the cell by a membrane.

One of the fundamental questions for evolutionary theory according to which all life has a common origin is the development of eukaryotes.

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According to a theory developed by Lynn Margulis, eukaryotes arose by symbiosis between a variety of prokaryotic organisms.² This theory postulates three different “symbiotic events”;

(a) Union between a prokaryote which obtains energy by fermentation, and a prokaryotic cell with an oxidative metabolism. The latter then evolved into what we now know as the mitochondrion.

(b) Symbiosis with a mobile prokaryote which possessed a flagellate structure consisting of two rods surrounded by a ring with nine filaments made of the protein tubulin. The spindle apparatus important for mitosis in eukaryotic cells consists of tubulin, and it is suggested that it originated from this flagellate structure.

(c) Union with a prokaryote resembling the blue-green algae we know today, which developed into the chloroplast.

John Maynard Smith has argued in favour of this approach;

“The main evidence for the theory is the fact that both mitochondria and chloroplasts have their own DNA and their own protein synthesizing machinery, so that they almost seem to be organisms in their own right. But not all the proteins of these organelles are made *in situ*; some are specified by nuclear genes and synthesized in the cell cytoplasm. So if, as most biologists now think, these two organelles were once independent organisms, they have lost their independence during the last 1,000 million years.”³

There are a number of strong arguments against this theory, however:

(a) It is based on the assumption of a reducing primeval atmosphere. Recent investigations however have shown that this assumption has become rather doubtful.⁴

(b) Prokaryotes which possess flagellar structures made of tubulin do not exist today and there is no evidence that they ever existed. Flagellar structures of prokaryotes consist of simple rods made of a single protein known as flagellin. John Maynard Smith admits that this is a strong argument against the theory.

(c) The evolution of the mechanism for photosynthesis is by no means clarified.

In the scenario constructed by J. William Schopf, which is currently widely accepted⁵, the first living organisms were some form of anaerobic bacteria, initially at least deriving their energy from the fermentation of materials organic in substance but of nonbiologic origin.

The next stage was the rise of the first photosynthetic organisms, more than 3 billion years ago, leading to a rise in the oxygen-level of the atmosphere and aerobic photosynthesis evolved in the mid-Precambrian. The first eukaryotes are reckoned to have appeared about 1.5 billion years ago (algae).

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There are mainly two arguments supporting this scenario:

- (1) The assumption of a reducing primeval atmosphere.
- (2) A sophisticated analysis of the metabolic pathways of anaerobic prokaryotes, showing how they may have developed into the aerobic metabolism of the eukaryotes.

If the first assumption turns out to be false or uncertain, then the same applies for the entire scenario. The arguments used to show that anaerobic bacteria developed into aerobic prokaryotes can be used to argue in favour of the reverse process — that the anaerobic organisms developed from aerobic prokaryotes. Some authors have argued that chemoautotrophous bacteria which derive their energy from simple chemical substances have a simplified metabolism derived from heterotrophous bacteria rather than the other way round.⁶ G.A. Kerkut analyses four different propositions about the relationship between bacteria and protozoa:

- (1) Bacteria and protozoa originated independently
- (2) Bacteria are the precursors of protozoa
- (3) Bacteria are simplified forms derived from the protozoa
- (4) Bacteria have a polyphyletic origin, e.g. some are precursors of the protozoa, and others are derived from them.

His conclusion is that we can say nothing definitive about the evolution of bacteria and protozoa — the available evidence does not lead us beyond the realm of mere speculation.⁶

The origin of the metazoa

There is no unanimity among biologists regarding the origin of the metazoa. We can discern four distinct approaches:

- (1) The metazoa derived from colonies of protozoa. A colony of protozoa developed into a coordinated unit consisting of several cells.
- (2) The metazoa arose from a syncytial protozoan — a protozoan with several nuclei in one cell. If a membrane would form to separate the nuclei from each other, then a multi-celled organism would come to exist.
- (3) The metazoa arose from metaphyta (multi-celled plants).
- (4) The metazoa arose from unicellular plants.

Protozoa are by no means simple organisms. Some protozoa are as complex in one cell as many metazoa. As G.A. Kerkut has shown, it is sometimes difficult to maintain a strict distinction between colonies of protozoa and metazoa, and any classification with respect to phylogenetic relationships is quite speculative. Many researchers have even maintained that colonies of protozoa have formed from metazoa, rather than the other way round. Other workers (in particular J.R. Baker and A.C. Hardy) have suggested that metazoa evolved from primitive plants. J.R. Baker has suggested that

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metazoa developed from unicellular plants; A.C. Hardy believes that they are derived from metaphyta. Critics have said however that the step from plant life which derives its energy by photosynthesis to metazoa with complicated digestive systems is too great. Why should organisms, which already possess a very complex metabolic system give it up in favour of a completely different one? Many researchers believe that chlorophyll, a rather complicated substance, did not arise until very late. Another objection would be that the membranes of plant cell are made of cellulose, which would hinder the formation of pseudopodiae necessary for locomotion and taking in food.

The well-known palaeontologist Sir Gavin de Beer rejects the idea that the formation of metazoa might have taken place simply by the formation of colonies of protozoa, because the strong coordination between the various cells can only take place by the formation of axes and integration into one body.

In the face of this maze of speculations G.A. Kerkut has concluded:

“What conclusion then can be drawn concerning the possible relationship between the Protozoa and Metazoa? The only thing that is certain is that at present we do not know this relationship. Almost every possible relationship has been suggested, but the information available to us is insufficient to allow us to come to any specific conclusion regarding the relationship. We can, if we like, *believe* that one or other of the various theories is the more correct but we have no real evidence.”⁸

Kerkut distinguishes five main groups of metazoa to be found in the lower Cambrian:

- (1) Porifera (Sponges)
- (2) Mesozoa (primitive parasites)
- (3) Coelenterata (jellyfish, anemones, and corals)
- (4) Ctenophora
- (5) Plathelminthes (flatworms)

We could add

- (6) Archaeocyatha
- (7) Brachiopoda
- (8) Mollusca
- (9) Arthropoda (crustaceans, trilobites)
- (10) Echinodermata (spiny-skinned animals, e.g. starfish, sea urchins)

How can these different phyla of invertebrates be related phylogenetically? One only has to look at a modern textbook of invertebrate zoology or invertebrate evolution to find out that nobody has anything more than vague hypotheses to offer on this point. Thus David Nichols has poignantly written:

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“One might think that students of invertebrate zoology, when faced with the same evidence, would come up roughly with the same conclusions as to its application to the evolutionary picture, that there would be a broad similarity in the phylogenetic trees produced from the available facts. But this is far from the case.”⁹

He speaks of the evidence from the fossil record “fickle and fragmentary though it is, and downright conflicting though it appears to be.”¹⁰ and comments, “Hanson has given a poignant simile: the phyletic biologist has to reconstruct a tree in every detail of its branching when he is given only the outermost leaves.”¹¹ R. McNeill Alexander, in his book on invertebrate zoology, gives us a taste of the kind of arguments pursued in this most esoteric of all the sciences, invertebrate phylogeny.

“It is not at all clear whether the Cnidaria or the flatworms came first. On the one hand it can be argued that the Cnidaria are simpler (with only two layers of cells), that they must have evolved from a planula-like ancestor and that all more complex animals must have evolved from them. On the other hand it is possible to argue that the only planula-like animals are Acoela and that the other multicellular animals including the Cnidaria must have evolved from them.”¹²

Little wonder then, that Alexander begins his discussion by saying,

“Many books have a lot of pages about how the various phyla of invertebrates have evolved from some ancestral animal. The evidence on which these discussions are based is so slight and any conclusions so insecure that it seems best to keep this discussion short.”¹³ He concludes his discussion by saying “. . . though we know so much about the structure and habits of invertebrates and about how their bodies work, our attempts to work out how the phyla evolved are little better than guesses.”¹⁴

The Fossil Record

In order to reconstruct the evolution of the invertebrates, paleontologists have researched a great multitude of fossils. One feature of the fossil record that puzzled paleontologists was that rocks below a certain level seemed to be devoid of fossils of animal or plant remains. The lowest obviously fossil-bearing deposits were assigned to the Cambrian period. While the Precambrian formations contain hardly any fossils at all — at most a few algae and bacteria we find most invertebrate phyla in Cambrian formations, without any evidence of any precursors. This phenomenon, which is generally known as “the Cambrian explosion”, has been succinctly described by Joachim Scheven:

“The desired common ancestors are missing . . . in the invertebrate fossil remains. All the different basic types of lower marine fauna make their

first geologic appearance in a completely developed form. Their remains witness to sometimes strange, but no less perfect adaptations and biozones as the recent forms.”¹⁵

Daniel Axelrod has described how problematic this fact is for evolutionary theory:

“One of the major unsolved problems of geology and evolution is the occurrence of diversified, multicellular marine invertebrates in Lower Cambrian rocks on all the continents and their absence in rocks of greater age . . . Their high degree of organisation clearly indicates that a long period of evolution preceded their appearance in the record. However, when we turn to examine the Precambrian rocks for the forerunners of these Early Cambrian fossils, they are nowhere to be found.”¹⁶

It is no longer true to say that there are no Precambrian fossils at all, so in order to see how the new findings relate to the problem of the Cambrian explosion, let us briefly survey the results to-date. (We follow here a recent review article by Chris Peat and Will Diver).¹⁷

The oldest signs of organic activity in the fossil record are stromatolites claimed to be about 3.4 billion years old. Stromatolites are not fossils strictly speaking, but products of a complex interaction between organisms and processes of sedimentation. Their formation can be observed today.

For example, on the tidal flats and saline flats (*sabkhas*) of the Persian Gulf the surface of the sediment is covered with felted mats of microbes dominated by blue-green algae. Many of these cyanobacteria, as they are also called, secrete slimy sheaths around their cells which protect them from desiccation and intense sun rays. Some of the filamentous forms move by a peculiar gliding motion, and when a layer of sediment is deposited on top of the mat they glide upwards between the particles of sediment to form a new mat, in the process leaving behind their former sheaths in the mat underneath the sediment. This process then leads to the building-up of fine layers containing organic material and sediment, which form the characteristic laminations of the stromatolite. Usually the organic components of stromatolites are destroyed by decay and oxidation, but during the solidification and compaction of the sediment subtle textural fabrics develop that often enable the original influence of microbial activity to be recognized. J. William Schopf writes about microfossils in stromatolites:

“Today microfossils have been identified in some 45 stromatolitic deposits . . . The fossils are often well-preserved, the cell walls being petrified in three-dimensional form, and they have become a prime source of documentation for the early history of life.”¹⁸

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The oldest claimed microfossils of prokaryotes are alleged to be 2.5 billion years old. There is much dispute about the date of appearance of the first eukaryotes. The more optimistic school of thought claims microfossils of eukaryotes in formations 1.4 billion years old, but the only real hint that they might be eukaryotes is their size (larger than 100 micrometers), which, as J.W. Schopf admits, is not conclusive evidence. The earliest generally accepted trace fossils are about 750 million years old (i.e. Precambrian). They are simple burrows and trails made by worm-like invertebrates, already quite complex metazoa. Following that we find impression fossils of soft-bodied metazoa, such as jellyfish and bilaterally symmetric worms (dated at between 680 and 600 million years, i.e. just about still Precambrian). Christ Peat and Will Diver try very hard to make this evidence look very impressive, by adding comments such as this:

“The idea that multicellular animals (or metazoa) with their cells organised in tissues instantaneously appeared at the end of the Precambrian period is incorrect, according to geologists working on a refined definition of the beginning of the Cambrian period. In support of their views is much new evidence from trace fossils . . .”¹⁹

In reality, however, the evidence which they cite and which we have summarised here is very thin and supports no such conclusion, as Stephen Jay Gould clearly recognizes:

“Darwin’s difficulty has been partly circumvented. We now have records of Precambrian life stretching back more than three billion years. Fossil bacteria and blue-green algae have been recovered in several places from rocks dated at between two and three billion years in age. Nonetheless, these exciting finds in Precambrian paleontology do not remove the problem of the Cambrian explosion, for they include only the simple bacteria and blue-green algae . . . and some higher plants such as green algae. The evolution of complex Metazoa (multicelled animals) seems as sudden as ever. (A single Precambrian fauna has been found at Ediacara in Australia. It includes some relatives of modern fan corals, jellyfish, wormlike creatures, arthropods, and two cryptic forms unlike anything alive today. Yet the Ediacara rocks lie just below the base of the Cambrian and qualify as Precambrian only by the slimmest margin. A few more isolated finds from other areas around the world are likewise just barely Precambrian.) If anything, the problem is increased because exhaustive study of more and more Precambrian rocks destroys the old and popular argument that complex Metazoa are really there, but we just haven’t found them yet.”²⁰

A number of theories have been suggested to deal with the puzzling problem of the Cambrian explosion. I would like to briefly list and discuss a few of them.

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- (1) The Precambrian formations were generally exposed to such heat and pressure that the fossils were not preserved.
- (2) All early metazoa were soft-bodied. They did not have any hard parts (perhaps due to the lack of calcium in sea water) and were thus not preserved as fossils.
- (3) At the beginning of the Cambrian period the metazoa developed by larger “quantum leaps” of evolution.
- (4) The Precambrian organisms were too small to leave recognizable fossils.
- (5) Precambrian organisms existed mainly near the shore, an active area in which the fossilization of organisms is less likely.

None of these explanations contribute significantly to the solution of the problem, for the following reasons:

(1) Stephen Jay Gould comments succinctly, “This is empirically false, beyond any doubt.”²¹

(2) This theory demands an explosive development of diverse hard parts, thereby creating a new problem without solving the old one, as Stephen Jay Gould explains,

“A clam without a shell is not a viable animal; you cannot clothe any simple soft-bodied organism to make one. The delicate gills and the complex musculature clearly evolved in association with a hard outer covering. Hard parts often require a simultaneous and complex modification of any conceivable soft-bodied ancestor; their sudden appearance in the Cambrian, therefore, implies a truly rapid evolution of the animal they cover.”²²

(3) This, of course, is the solution advocated by Stephen Jay Gould, and I will therefore quote him at length:

“J.J. Sopkoski, a paleontologist at the University of Rochester, has recently found that a plot of increasing organic diversity versus time from the late Precambrian to the end of the “explosion” conforms to our most general model of growth — the so-called sigmoidal (S-shaped) curve. Consider the growth of a typical bacterial colony on a previously uninhabited medium: each cell divides every twenty minutes to form two daughters. Increase in population size is slow at first. (Rates of cell division are as fast as they will ever be, but founding cells are few in number and the population builds slowly towards its explosive period.) This “lag” phase from the initial, slowly rising segment of the sigmoidal curve. The explosive, or “log” phase follows as each cell of a substantial

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population produces two fecund daughters every twenty minutes. Clearly this process cannot continue indefinitely: a not-too-distant extrapolation would fill the entire universe with bacteria. Eventually, the colony guarantees its own stability (or demise) by filling its space, exhausting its nutrients, fouling its nest with waste products, and so on. This leveling puts a ceiling on the log phase and completes the S of the sigmoidal distribution . . . The lag phase of life is the slow, initial rise of latest Precambrian times. (We now have a modest fauna of latest Precambrian age — mainly coelenterates (soft corals and jellyfish) and worms). The famous Cambrian explosion is nothing more than the log phase of this continuous process, while post-Cambrian leveling represents the initial filling of ecological roles in the world's oceans (terrestrial life evolved later)."²³

If the analogy Gould works with would really hold, this clever argument would solve the problem. However, Gould provides no quantitative analysis to show that his argument actually does work. There are reasons to suspect that it does not.

The first is that the fossil evidence from the Precambrian is so meagre that it is doubtful that there would be quantitatively a sufficient starting point for such an explosive burst of evolution. The second is that the evolutionary process is not like cell division, and that a mechanism for such rapid evolution needs to be found. I have criticized Gould's theory of "Punctuated Equilibria" on these grounds elsewhere²⁴, but the scale on which such mechanisms are intended to apply here really strains the limits of credulity. In reality, Gould's model is simply a description of a process he believes took place, but not an explanation.

(4) This theory cannot be maintained in view of the microfossils in the Precambrian. There still would have to be sufficient precursors of the Cambrian fauna large enough, to be preserved, otherwise the unbridgeable gap remains.

(5) Even if the assumptions of this argument were correct, which is doubtful, the statistical probability of fossilization would still have been large enough to yield a reduced, but significant number of fossils.

We see that invertebrate evolution presents a complete impasse for evolutionary theory, and that the theory of evolution is unable to provide a plausible explanation for the origin of the large majority of the animal kingdom.

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BOOK REVIEW

The Myths of Human Evolution

by Niles Eldredge and Ian Tattersall

Published by: Columbia University Press (1982)

"In the endless Socratic quest of "know thyself", evolutionary theory must play a large part. Current debates in evolutionary theory have important implications for our understanding of ourselves. In this book, two intellectual leaders in these debates discuss human evolution, and suggest that our view must be radically revised once we understand how old prejudices constrain us and how new ideas might lead us." Stephen Jay Gould.

The current debates to which Gould refers are concerned with the pattern of evolutionary change: whether evolution proceeds along a slow, gradual pathway or whether it is characterised by larger, abrupt and infrequent changes. The gradualist side of the debate is defended by the neoDarwinists and their protagonists are the advocates of punctuated equilibria. Eldredge and Tattersall belong to the latter group, and their book provides both a vigorous and incisive argument against the gradualist myth and also a defence of the key concepts of their alternative model.

Evolutionary Gradualism

The authors claim that their book is about contemporary myths. These myths pervade the minds of scholars and influence their judgment. Their interpretations of the data are affected by their preconceived ideas about living things and how they evolve. The first and most important myth to be exposed is the concept of gradualism in evolutionary change, which is championed by Darwin's theory of evolution by natural selection. This theory requires changes to be essentially slow and gradual. The authors link the Darwinist approach to evolutionary change with the Victorian myth of progress — a philosophical concept which had affected the minds of Darwin and his contemporaries. Scientists are part of the age in which they live, and prevailing philosophies have a sub-conscious and far-reaching influence.

To develop his ideas on evolution by natural selection, Darwin found it necessary to argue for continual change and to challenge the creationist idea of the fixity of species. He revised the meaning of "species" to refer to

ephemeral breeding communities which inexorably transform themselves out of existence. In Darwin's view, species are not "real", but are only interpreted as "fixed" by observers who are constrained by short time scales. The time perspective was sought from the fossil record. Darwin predicted a continuum of evolutionary change, but instead of that, only discrete species were recognised. At the time, this problem was side-stepped by describing the fossil record as highly impoverished.

As the science of genetics developed, the emerging synthetic theory of evolution proposed an explanation of speciation and evolutionary change which was widely accepted. The illustration of the Adaptive Landscape was popular. Hills and valleys represent hypothetical genetic states related to the fitness of individuals. The hills are ecological niches and the valleys are unoccupied, inhospitable areas which maintain species identity and distinctiveness. As the topography of the adaptive landscape changes, natural selection acts on species occupying the hills and brings about evolutionary change.

"The imagery fits the facts rather well. And it gives us a single, unified, and charmingly simple explanation of the evolutionary process, an explanation which encompasses gene frequency changes from generation to generation, all the way up through the origin of the different phyla and even the five currently recognised kingdoms of life. It shows how the evolution of kingdoms is in principle no different from the shifts of gene frequency seen within species. In fact, it says all evolution reduces to nothing more than change in gene content and frequency within species. The process is adaptive, as natural selection guides change in response to changing environments. It is, at once, a simple view and a sophisticated version of Darwin's original conception. And it is, in a profound sense, probably wrong. It is one of the greatest myths of twentieth-century biology." (p. 43).

The model as described fails to give adequate weight to the evidence that species are concrete realities in time and *through time*. The authors argue that Darwin's estimate of a species is mistaken. The argument about an impoverished fossil record has become fallacious, and the prediction that a continuum would be found as the record was intensively studied has proved erroneous. Palaeontologists find that species are relatively static through time. Consequently the Darwinian concept of "species" needs revision. Species are "born", they "live" and they "die". They are real entities and are not part of a vast continuum. The origin of these real species is the key issue today — and the modern synthetic theory of evolution does not address the fundamental problems of their ancestry and descent.

Investigations of Human Evolution

Moving on from this general discussion of evolution and the pattern of evolutionary change, the authors take a fresh look at the evidence for human evolution. A lengthy chapter provides an extensive summary of the highlights of the history of the hominid fossil record. It is a well-written and interesting review. Comments are made on the Neanderthals, Java Man, Peking Man, the Australopithecenes, and the recent finds at Omo, East Turkana, Hadar and Laetoli. The participants in these investigations were united in their commitment to evolutionary gradualism. This has meant an intense interest in the absolute dating of their finds.

“Since evolution is usually equated with change — constant change — and the evidence for and the implications of nonchange are widely ignored, dating has been regarded as being of the essence. If a form is early in time, the myth runs, it can, if there is nothing really remarkable in its morphology to prevent it, be conveniently plugged into the scheme as an ancestor. If it occurs late, then it qualifies with little more ado to be a descendant.” (p. 108)

Eldredge and Tattersall argue that preconceived ideas have dominated these investigations: the myth of gradualism and the myth of single species evolution. “So bewitched were the single-species people by the simple elegance of this myth that they were reluctant to see it marred by messy speciations.” (p. 120) However, since the 1950’s the single species myth has become untenable, although the traditional preconceptions about evolutionary change has hindered progress in seeing the emerging patterns. If other parts of the fossil record do not show a pattern of gradual evolutionary change, why should it be expected in the case of human evolution?

The authors embark on a search for pattern in the hominid fossil record. They adopt a cladistic approach — discussing characters suggesting relationships rather than trying to identify ancestors or descendants. The summary of their findings is worth quoting here.

“What, then, does the hominid fossil record tell us about pattern in human evolution? Does it tend to confirm the idea of gradual directional change or does it suggest a more episodic sequence of events? Where a clear pattern does emerge, it supports the second alternative, but there are stretches of time when no clear pattern is discernible at all.”

So, the hominid fossil record does have its problems of interpretation, and classification is difficult in some cases. However, the majority of the data seems to conform to the punctuated equilibria model.

Cultural Evolution in Historical Times

The last two chapters of the book extend the study to cover patterns of change in human history. The authors claim to find evidence of sporadic change rather than gradual change, but, unlike the sociobiologists, they question the need to find one all-embracing theory to account for similar patterns of cultural and biological evolution.

Comment

Eldredge and Tattersall have written their book in the context of the debate between neoDarwinists and the advocates of punctuated equilibria. Creationism receives but a passing mention. However, the authors may be surprised to know how much common ground there is between themselves and creationists — their assessment of gradualism as a Victorian philosophy; their recognition that preconceptions are of major importance in scientific studies; their evaluation of the Adaptive Landscape; their view of species; their rejection of gradualism in the fossil record; their analysis of factors affecting past studies of human evolution; and several other topics not mentioned in this review.

Some aspects of the discussion are worthy of treatment in greater depth. Thus, for example, there is the question as to whether *Homo erectus* should be admitted to the genus *Homo*:

“To be iconoclastic for a moment, however, we should point out that in fact even *Homo erectus* is substantially more different from *Homo sapiens* (the first-named [type] species of the genus and therefore the one with which all other potential members of the genus are to be compared) than are most if not all other mammalian species from the type species of their genera. Of course, we do not wish to annoy our colleagues by suggesting the renaming of any fossil hominids, but we do think it is wise to bear in mind that the standards of generic classification normally applied in mammalian studies are not necessarily those applied these days in palaeoanthropology. It seems almost as if to exclude various early hominids from *Homo* smacks of discrimination to the good-hearted liberal sentiments of many palaeoanthropologists.” (p. 137)

It would be helpful to spell out these “standards of generic classification” and to elaborate on the statement just quoted.

The reviewer is continually amazed that studies of fossil man make so little reference to the anthropoid apes and their fossil ancestors. How is it possible to gain a clear understanding of the data if the focus of attention is solely on hominids and human ancestry? Of particular interest is the work of Charles Oxnard, with his multivariate analysis of *Australopithecus* in comparison to similar analyses of men and apes. His conclusion was that *Australopithecus* was not an intermediate fossil form, but was a unique species of ape. It is surprising that Oxnard's work receives no mention in the book under review.

Furthermore, it is essential to remember that all bones were once part of living, breathing animals. Bone structures have biological significance, and skulls should be considered as a part of the total animal. Failure to appreciate this will inevitably result in the creation of biological monstrosities — such as the early representations of the Neanderthals. This reviewer would like to see a greater awareness of biological considerations in discussions of animals claimed to be ancestral to man.

Finally, it is important not to overlook one myth which is apparently accepted by Eldredge and Tattersall (on page 2). The idea is now very widespread that science prohibits supernatural events. The reality is that science has *nothing* to say about supernatural events as they fall outside the scope of scientific investigation. It is naturalistic philosophy which prohibits the supernatural, and not science. Those who identify science with naturalistic philosophy are doing science a disservice. Were Eldredge and Tattersall to appreciate this distinction, they would find it necessary to broaden the scope of their discussion of human origins to include the concept of divine creation. Then, the words of Stephen Jay Gould, quoted at the beginning of this review, would take on a deeper significance.

David J. Tyler

The Guadeloupe Skeletons (continued from page 52).

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A LINKOLOGICAL STUDY OF MAN AND APE

Gerald Duffett

Imagine having to design the human body from scratch. Even from pre-existing molecules it would be a tall order. So let us make our task easier by assuming that we have only to transform a four-legged mammal into a human being. In effect let us consider those changes which are supposed to have taken place in the alleged evolution from lemur to man.

Once we decide to allow the present structure of the human hand as the first human feature to arise, then the result will be as familiar as it was unexpected. Try as we may, the process of designing the human body always boomerangs back to the starting point of the human hand. The reason why that is inevitable is to do with the subject of design linkage.

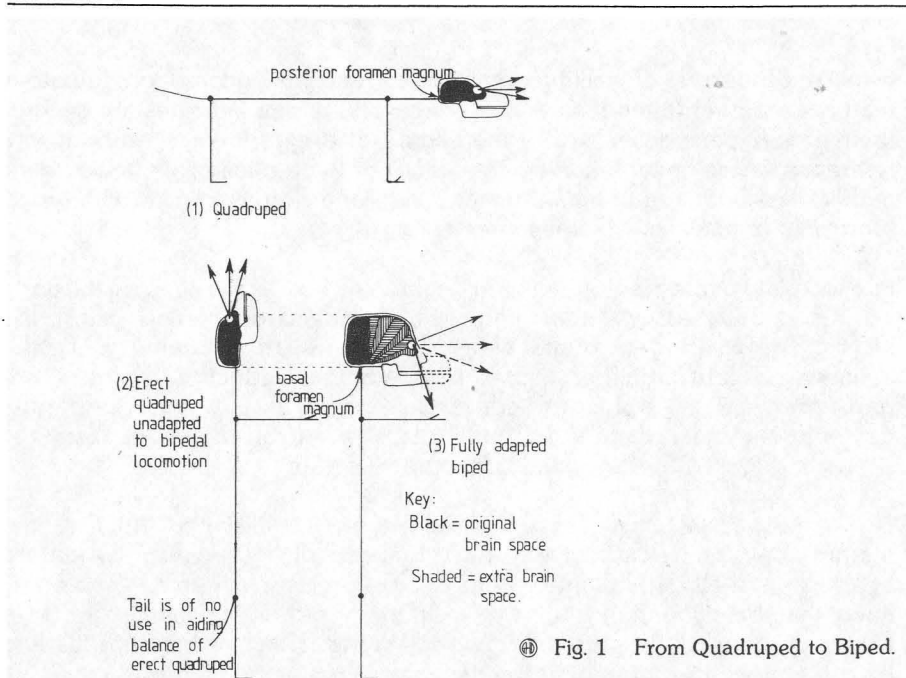
Also there is a definite connection between structure and function. If the saying 'Handsome is as handsome does' mean anything to a biologist, it is that parts must work. The motto 'Manners maketh man' makes more biological sense if altered to read 'Manus maketh man'! Soon we will investigate the repercussions that will occur if ever an animal's front paws became human hands.

The human hand is unique amongst all known living vertebrates. The tip of each finger is able to touch the tip of the thumb. Also the thumb itself moves across the palm of the hand to point to each finger in turn. Truly it is a joint effort. Technically this ability is termed 'the opposability of the pollex'. This is clearly a star feature of the human hand or manus. So it will head our list where each stage of our present study is prefixed by a letter for reference.

- A. *Opposability of the pollex.* Having movable digits and the ability to perform rotatory wrist movements make the manus dexterous. That is ideal for manipulation and manufacture. But it makes the human hand ill-adapted to bear the body's weight from above during locomotion. So two things follow. One is that the front limbs will play no special part in locomotion on land when travelling on the surface of the ground. The other is that the arms need not be long enough to reach the ground when man is standing.

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- B. *Bipedalism*. The hind limb alone must carry the weight of the body during locomotion. So only two legs are used instead of four. Therefore, another two things follow. One is that the foot or pedus will have a larger surface of contact with the ground. The other is that the legs can best carry the rest of the body's weight if it is held directly above them. To facilitate that the hip socket will need to occupy a different position in a biped compared with a quadruped.
- C. *Erect posture*. The upright stance results from having to bear the body's weight over the hind legs. In other words the rear end helps the body to rear up. So the vertebral column ('backbone') must be held vertically instead of horizontally. In the new position each vertebra straddles the one below it. The overall effect is like a stack of inverted tumblers. But one unfortunate consequence results. It demands immediate rectification, yet evolutionary theory will not allow for the new snag to be immediately put right. The problem is that the modified lemur cannot see where it is going. Having a changed posture would result in erect posture making the eyes look up straight at the sky.
- D. *Frontal vision*. To enable the individual to see the way ahead, the eyes should face the front. Therefore, the face must be turned through 90° to scan the direction of locomotion. Also to judge distances, the eyes must be fairly close together. Only then will their fields of vision overlap. Two features are linked with stereoscopic vision. They are flattened fovea in the retina of each eye and incomplete decussation at the optic chiasma. But the next repercussion is more obvious than those.
- E. *Enlarged brain*. With the rotation of the eyes and face to point forward, there is more room within the skull to accommodate a bigger brain than would have been the case before. A glance at Figure 1 shows that the biped has cranial capacity for an enlarged fore-brain rather than any scope for development of the hind-brain compared with a quadruped of similar size. The same increase in volume applies to a concertina. When pulled and bent, the bellows fill out on the curve.
- F. *Reduced jaws*. The muzzle of a quadruped does not obscure vision of the ground to make locomotion slow. But a biped finds a muzzle presents any visual check of the ground before taking the next step. Yet with the head high above the ground any unexpected unevenness could cause imbalance. A sprained ankle is a real problem to a biped. So without a projecting muzzle to protect the eyes during facial injury there is need to set them in deep sockets. Not only does the human nose act as a shock absorber, situated between the eyes it hardly interferes with our field of vision.



- G. **Weaker teeth.** Having reduced the size of both jaws to better see where to take the next steps has another repercussion. Smaller jaws have smaller dental arcades. So teeth must be fewer in number if their size is to remain the same. So what teeth exist are needed for chewing. No room can be spared for the main incisors required to groom and comb body fur.
- H. **Hairless body.** Without jaw room for special teeth to clean body fur, unkempt fur would soon harbour bacteria. These, in turn, could cause disease or produce odours from food particles which would be detectable by man's predators or prey. Either way dirty body fur would be a disadvantage to man. Design linkage can account for man's naked condition. More than that, it explains other human features not characteristic of apes.
- I. **Domed palate.** The human dental arcade is shaped like a letter C. This enables the palate to be like part of a dome. Acoustically the human palate compares very favourably with the 'Whispering Gallery' under the dome of St. Paul's Cathedral, London. Certainly both structures help to project sounds made by the vocal cords within the larynx.

The various features mentioned above arise as a consequence of the delicate nature of the human hand. Because of the inability of the human manus to

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withstand the stress of walking on all fours for normal locomotion, the other features are interdependent. Also distinctively human activities are seen in their proper perspective within the setting of design linkage, without any reference to ape or evolutionary concepts. For the reduced jaws, fewer teeth and hairless body require man to make tools and clothes to cope with tough food, wild animals and bad weather.

Fire too plays a role in softening food, frightening beasts and keeping the body warm. Yet until the Curse Adam and Eve had no need for defence against wild beasts. The wearing of animal skins and the use of fire came by Divine initiative. Because neither comes from natural instinct, techniques are transferred by example and education, which always involve manual dexterity, cerebral activity and speech. All play a key role in the set of features shown in Figure 2, a suggested 'Linkogram of Man'.

Now the point I wish to make is a familiar one. Yet it is still valid. Which human feature came first? In case anyone thinks that each distinctively human feature evolved gradually, then simply consider feature B in Figure 2. Zoologists know that the hip joint must occupy a different position in a biped compared with a quadruped. Yet Professor Verna Wright (Head of the Arthritis and Rheumatology Department at Leeds University) has pointed out a snag.

KEY

- A OPPOSABLE POLLEX
- B HIND LEGS CARRY BODY
- C VERTICAL VERTEBRAL COLUMN
- D EYES ON FRONT OF ROTATED FACE
- E LARGE BRAIN AS FACE TURNS VIA 90°
- F REDUCED MUZZLE TO SEE NEXT STEP AHEAD
- G LESS ROOM FOR FUR-COMBING TEETH
- H NO EXTENSIVE BODY FUR
- I CAP-LIKE PALATE

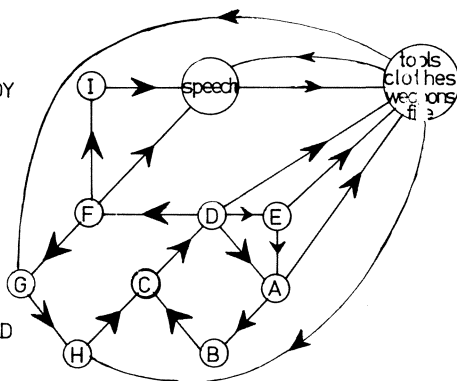


Fig. 2 Linkogram of Man. ④

The snag is that if, during an animal's evolution to become man, the hip socket ever occupied an intermediate position, then the balance of the body would be unstable. Because of its poor balance a semi-erect ape-man would soon become extinct. The cause of that extinction is the same process that keeps all

body design on its toes — natural selection. So if any ape-men existed they would have been selected out of existence. They would prove to have become 'has beens' instead of human beings.

Design linkage is a phenomenon that exists in the experience of zoologists but is never called that. Lancelot Law White probably called it 'internal factors' and claimed that there may be no mutations which can be fully ascribed to chance. Also Professor W.H. Thorpe declared:

'The conditions of biological organisation restrict, to a finite discrete spectrum, the possible avenues of evolutionary change from a given starting point. The nature of life limits its variation and is one factor directing phylogeny . . . internal selection restricts the direction of evolutionary change by internal organisational factors.'

Obviously the best starting point when trying to unravel any elements of design linkage would be that one which makes sense of the maximum number of other elements. Therefore let us turn our attention to appreciate something of the design linkage in apes.

In the wild it is important that apes can quickly reach up to branches of trees and swing up into the canopy for cover. So whereas 'manus maketh man': 'arms make the ape'. That is why long arms come as the first feature in Figure 3, entitled 'Linkogram of Ape'. Then it follows that an ape must have its eyes placed in a suitable position for looking up. Therefore the ape has eyes higher up the skull than compared with man. This in turn leads on to two consequences. The first is the exact opposite to the human condition. Having eyes higher up than in man makes less room above its eye sockets. So the frontal lobes of an ape are smaller than man's. The second is that there is now more room for larger jaws to hold stronger teeth as the eyes as higher up the skull.

However, having a large muzzle (protruding jaws) means that the ape is prevented from readily seeing where next to place its feet, when walking on ground. Of course, up in trees apes can only swing safely from branch to branch because the feet on their hind legs are more like hands. Each so-called 'foot' of an ape has its big toe arranged like a thumb for grasping branches. So whereas man has an opposable pollex (thumb) the ape has an opposable hallux (big-toe).

Clearly there is something (or 'thumb-thing'!) wrong with the idea that mankind came from apes or even ape-men which fall between two stools of design linkage. Although the ape appears to walk semi-erect on land, that

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KEY

- A LONG ARMS
- B EYES HIGH UP FACE
- C SMALLER CRANIUM
- D LARGER JAWS
- E STRONGER TEETH
- F THUMB-FOOT
- G BODY FUR
- H LONGER DENTAL ARCADE
- J NO ARTEFACTS
- K NO SPEECH

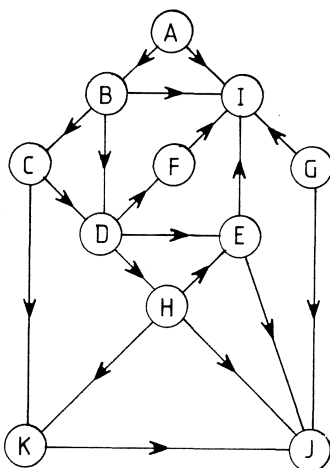


 Fig. 3 Linkogram of Apes.

must not be mistaken as a stepping stone to the upright stance of man. Remember, the muzzle prevents an erect posture in ape locomotion because its eyes cannot monitor the ground close to its next step.

Therefore, to overcome the above short-comings the ape walks on the knuckles of its hands. This gives more length to its already long arms which make its legs relatively short. Because a straight limb holds the body's weight better than one that is bent, the ape travels on all fours with its head end higher than its buttocks.

Between man and apes there is a great gulf fixed. Yet this seems to be of little consequence in the popular imagination. That is because both species have eyes close together and lips that smile or grimace. On television commercials chimpanzees are sometimes seen 'aping' human speech. Nevertheless, design linkage presents any in-between variations with an impenetrable rubicon.

No wonder that the so-called missing-link between man and ape has not yet been found. It never will. For any improvement to help a species to survive in the wild, that improvement must first fit in with the other pieces already forming a set. Without the dove-tailing of parts into the set by design linkage the missing link could not have existed in the first place, second place, third place or in any other place. Such a view is borne out by an examination of the array of fossil men which pose as alternatives to Adam.

However, that examination is another study!

THE GUADELOUPE SKELETONS: IN THE STEPS OF CUVIER

David J. Tyler

I. Introduction

Historical investigations can be both fascinating and instructive. This study focusses attention on fossilised human skeletons discovered in 1805 on the island of Guadeloupe. In their day, the skeletons were well known. After a long period of obscurity, they have recently been brought again to the attention of the public. This review of historical developments and reappraisal of the fossils aims to clarify the issues in current debate and to point out important guidelines for the methodology of historical science.

II. The First Discovery of Fossilised Human Bones

The early 1800's was a time when geology was in its infancy. A catastrophist view of historical geology allied with an acceptance of the biblical account of the Noahic Flood was dominant. However, the non-catastrophic views of Hutton were growing in importance and the issues were vigorously debated¹. One of the problems faced by the catastrophists was the lack of human fossil remains: if the Antediluvian world was represented in the fossil record, should not human bones lie alongside those of animals? Despite many discoveries of fossilised mammals, human bones were noticeably absent.

Then, in 1805, a number of skeletons were discovered on the island of Guadeloupe by Manuel Cortes y Campomanes, a French Officer serving in the colony. The location was on the north-east coast of Grande-Terre, near the town of Moule. Because of their importance, the governor, General Ernouf, removed a skeleton and made it ready to send to Paris. However, because of the war that was then being fought between France and Britain, and because the Island of Guadeloupe was taken by the British, the specimen ended up in London, not Paris! Admiral Cochrane found the skeleton prepared for despatch and promptly sent it to the British Admiralty, who in turn offered it to the British Museum. It arrived in 1813 and has been there to this day (Fig. 1).

Charles Konig, curator of the Mineralogical Section of the Museum, examined the skeleton and wrote a lengthy description of it for the Royal Society of London². This paper reveals Konig holding to a multiple catastrophe scheme of earth history, with man as the most recent creation. He describes the

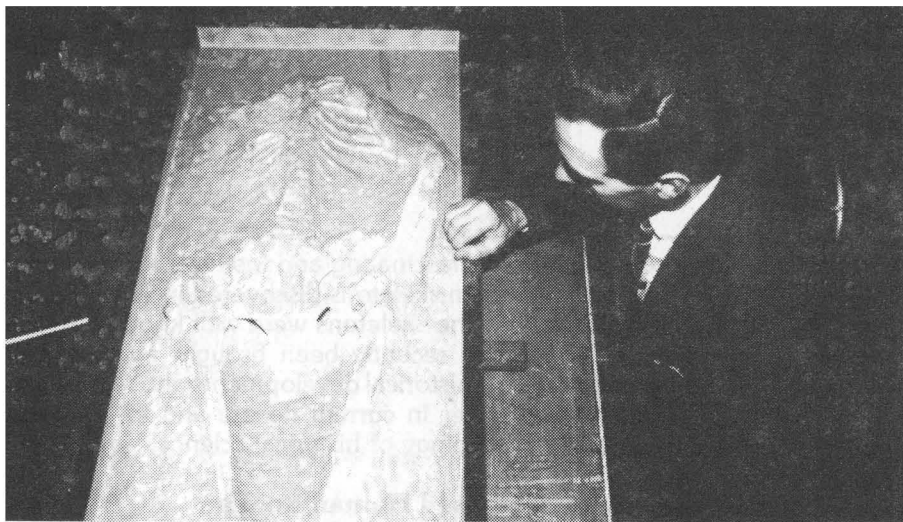


Fig. 1 The Guadeloupe skeleton in the basement of the British Museum (Natural History).

skeleton, noting that several bones were lost, including the skull and neck vertebrae. Many of the remaining bones were dislocated and broken. They were chemically analysed by Sir H. Davy who found some organic matter still present. Thus, the bones were not completely fossilised. The rock enclosing the skeleton was formed from calcareous sand and had been extensively cemented. Whilst precise identification of the source material for these sand particles was not straightforward, König concluded that most of it came from marine organisms. A few components were recognisable, and he reported the presence of a large shell similar to *Helix acuta* and another of *Turbo pica*. In addition, some non-carbonate materials were present: a piece of tusk, a fragment of basalt and some flecks of charcoal.

Regarding the field setting of the specimen, König was unable to supply substantial information. (It is quite possible that original documentation of the site was lost when the skeleton changed hands.) Most of his knowledge came from a book by M. Lavoisier entitled “Voyage à la Trinidad”, published in 1813. This work mentions the skeletons and states that the relevant limestone bed was a kilometre in length and was covered by sea at high tide. Within this limestone were “petrified” mortars, pestles and hatchets. According to Lavoisier, the skeletons were orientated east-west, and the spot was a cemetery. However, König justifiably questioned the reliability of this judgment in view of the vagueness of the account. Indeed, a general cautiousness characterised König’s paper, as although sympathetic to the idea that the limestone was recently formed, he stated that age indicators were lacking.

Shortly after the appearance of Konig's paper, there are indications that some viewed the skeleton as that of Antediluvian. A letter to the *Evangelical Magazine* in 1816 has the following comment:

"It will undoubtedly be gratifying to many of your readers to be informed, that a fossil human skeleton, which was dug out of a block of limestone in the island of Guadeloupe, was brought over, in 1813, by Sir Alexander Cochrane, and deposited in the British Museum for public inspection . . . The only plausible reason why a human body should be within a rock, is, that the rock, some time or other, must have been in a liquid state, produced by some extraordinary revolution in nature; and that revolution must have been the Deluge."³

With claims like this, it is not surprising that interest in the specimen was considerable. Further work was carried out — and largely by one man: the creationist Cuvier.

III. The Investigations of Cuvier

The Frenchman, Georges Cuvier, was a leading figure in geological circles at the beginning of the Nineteenth century (1). He was a comparative anatomist and vertebrate palaeontologist whose main work was concerned with the fossils and strata of the Paris Basin. His view of earth history was that there were many catastrophies, culminating in the Noahic Deluge, and he also held to the special creation of living things subsequent to major catastrophies. Consequently, he expected to find the remains of man in the sediments associated with only the last of the series of catastrophies.

The skeletons of Guadeloupe interested Cuvier, and in 1818 he visited London to see the skeleton and to discuss its interpretation with Konig. Subsequent to this, the Paris Museum received the second skeleton from Guadeloupe: this time removed by General Donzelot. An illustration of the Paris specimen is reproduced as Fig. 2. This skeleton is in the foetal position and, again, some of its bones are missing.

Although Cuvier did not visit Guadeloupe, he was supplied with much information by Moreau de Jonnes, a member of the Academy of Sciences, who was able to investigate at first hand. The skeletons were preserved in a limestone bank which was submerged by water at high tide. Debris of shell and coral was washed on to the beach and, as the sediment dried out, the particles became cemented together. The greatest compaction was where the water evaporated most readily. Cuvier's informant stated that formations like this were found all over the Antilles Archipelago and were known by the natives as "God's masonry" (*Maconne-bon-dieu*). Sometimes these limestone contained vases and other modern artifacts.

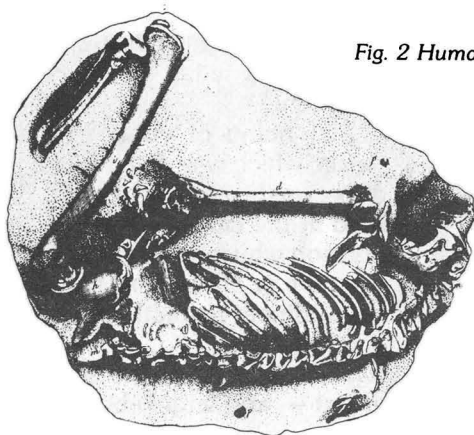


Fig. 2 Human skeleton from Guadeloupe:
the Paris specimen.

Since the rock could be seen in the process of forming, Cuvier felt justified in regarding the skeletons as recent. In addition to the shells recognised by Konig, Cuvier found *Bulimus guadalupensis* in the limestone of the Paris specimen — a mollusc that lives on the island of Guadeloupe today.

Regarding the interpretation of the skeletons, Cuvier confessed to making a thousand guesses and even inventing incidents to explain their presence! He relates the opinion of de Jonnes who thought they were simply the remains of people who perished in ship wrecks. (Much of the information reported in section II and III is taken from Cuvier's 1825 "Discours"⁴. A useful review of the history of the skeletons is provided by Grayson⁵, who gives additional references to relevant papers.)

IV. Subsequent Developments

Cuvier's analysis satisfied his contemporaries, and the recent origin of the skeletons was accepted as proven by d'Hombre-Firmas in 1821⁶ and de Serres in 1823⁷. In England, Buckland had no doubts about the matter:

"There is no reason to consider these bones to be of high antiquity, as the rock in which they occur is of very recent formation, and so composed of agglutinated fragments of shells and corals which inhabit the adjacent water."⁸

Further investigations were reported by Duchassaing⁹, a medical doctor who lived in Moule. According to local opinion, the remains belonged to the Galibis: the pre-European inhabitants of the island. Duchassaing explained the formation of the rock using stalactites as an analogy. Calcium carbonate was carried by rainwater to the beach, where it was precipitated, cementing the sand grains together. He described a number of objects he had found in

these limestones: stems of vines (*Coccoloba uvifera*) and other plants (*Gorgonia flabellum*), land snails (*Bulimus guadalupensis*) and pieces of pottery. In the upper part of the formation, he found a dog bone and some pieces of flint. He was quite convinced that the rock was recent, and thoroughly agreed with Cuvier. Indeed, he declared, since Cuvier's "Discours", the modern origin of these deposits had not been contested.

A few years later, Pictet accepted and used Cuvier's work in his review of ancient human remains¹⁰.

Dana, the American geologist, has a short note on the skeletons in his "Manual of Geology"¹¹. It contains additional information regarding the location of the skull of the London specimen, and also some unreferenced historical information.

"One of the most perfect of fossil skeletons found in solid rock is represented in Fig. 845 (The Paris specimen — cf. Fig. 2 of this article). It is from a shell limestone of modern origin, and now in progress, on the island of Guadeloupe. The specimen is in the Museum at Paris. The British Museum contains another from the same region, but wanting the head, which is in the collection of the Medical College at Charleston in South Carolina. They are the remains of Caribs killed in a fight with a neighbouring tribe about two centuries since."

The "Caribs" may be identified as the "Galibis", but there seems to be no way of checking the details about tribal warfare.

A reference to the London specimen is to be found in the *Journal of the Transactions of the Victoria Institute*: a journal produced by Christians interested in the relationship between the Bible and science. Towards the end of the Nineteenth Century, a brief discussion of evidences relating to fossil man was provided by Captain F. Petrie, the Hon. Sec. of the Institute. In his comments, he refers to information contained in a book entitled "Recent Origin of Man."

"With respect to the discovery of fossil human remains, many have been found, in regard to every one of which some controversy has taken place: a skeleton in the British Museum is a curious example; it is that of an Indian, killed in battle only two centuries ago; it is embedded in solid rock, and came from the north-west coast of Guadeloupe, where "the rock is a limestone, harder than statuary marble, and is forming daily: it contains minute fragments of shells and coral, encrusted with a calcareous cement resembling travertine, by which the particles are bound together: the skeleton still contains some of its animal matter and all the phosphate of lime." (Recent Origin of Man, p. 78). The foregoing remarks may show some of the difficulties with which we have to cope in our search for geological facts which will throw light upon "the antiquity of man".¹²

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The information assembled by Petrie can be traced back to Dana, Cuvier and Konig. The quotation is included here to show that Christian men of science fully accepted the widely held interpretation of the Guadeloupe skeleton: a point that is directly relevant to the next section of this article.

The skeleton continued to be exhibited in the British Museum (Natural History) as it provided a good example of a human fossil found in the New World. The public were informed that it came from a indurated beach in Guadeloupe and that it probably did not date back further than the historic period in that region.¹³

V. The Diluvial Interpretation Revived

A revival of the diluvial interpretation of the skeleton is due to an article by Bill Cooper in the Australian creationist journal *Ex Nihilo*¹⁴. Three major claims are made:

1. that the skeleton is embedded in Miocene limestone;
2. that its physical condition is such that catastrophic deposition alone can account for it;
3. that the British Museum (Natural History) has concealed the skeleton from public gaze because it was embarrassed by its implications for the theory of evolution.

These claims made a considerable impact, and it was not long before they were being repeated in literature circulating in the United Kingdom and in the United States of America.

A response from Chris Stringer of the British Museum (Natural History)¹⁵, argued that there was no ‘cover-up’, and that the skeleton was not evidence against evolution. Rather, it was partially fossilised in beachrock and was probably less than 500 years old. In his reply, Cooper maintained that the rock was Miocene limestone and the beachrock theory was untenable. In his opinion, the skeleton remained a witness for the Deluge and against evolution.

VI. The Limestone: Microscopical Examination

The key issue in this debate is whether the skeleton is embedded in Miocene limestone or in a recently formed limestone. Since beachrock has a distinctive appearance, it was considered worthwhile to examine the limestone in greater detail. Thin sections of the limestone enclosing the skeleton that had been prepared by the Museum were loaned to the writer. Fig. 3 shows a photomicrograph of a small part of one of these sections.



Fig. 3 Photomicrograph of limestone in thin section.

The limestone has an open texture and is grain supported. The sand grains are almost entirely of biogenic origin, and are fringed by a thin rim of radial, fibrous aragonite needles. A variety of source materials were identified, although a species-level taxonomic analysis was impossible.

1. Coralline algae. The bulk of the rock is composed of this material, which is recognised by its well-preserved layered structure (cf. middle top of Fig. 3). Many of the dark grains in the section are coralline algae.
2. Molluscs. Mollusc shell fragments constitute the next most plentiful component of the rock. They are irregular in shape and many of them have been bored by endolithic algae. These borings are filled with micrite, which shows up dark in the section. (Good examples are seen in the lower left of Fig. 3). So extensive has the boring been with some grains that they have micritic envelopes.
3. Echinoids. A few fragments are present. One is distinguished by a radial ornament and is probably a section of a spine.
4. Foraminifera. One fragment was noted (just right of centre in Fig. 3).
5. Quartz. A few quartz particles are present.
6. Other. There are grains of material present which are difficult to identify. There are possible sclerosponge fragments, an aggregate carbonate grain, an aragonitic ooid, and a few possible phosphatic bone fragments.

These grains are cemented together by radial laths of aragonite of uniform length. This is the form of calcium carbonate that is precipitated in beachrock.

Some comments on the formation of beachrock are appropriate here. Konig and Cuvier both described the rock as being composed of cemented calcareous sand grains. The mechanism of formation of these beach deposits was not elucidated in their day, but much work has taken place since then. The rocks are now referred to as beachrock, and they normally occur in the intertidal zone as a series of thin beds which dip seawards at less than 15° . They form in warm, tropical regions where evaporation rates are high. There are a variety of modes of cementation, but the most important is precipitation of aragonite from sea-water. Every time the tide retreats, evaporation of water from the beach sand contributes a little to the cementation process. Any objects enclosed by the beach sands will become cemented — and observations have recently been made of the incorporation of broken beer bottles¹⁶ and pepsi-cola cans.

The conclusion of this investigation is as follows. The limestone encasing the Guadeloupe skeleton has these characteristics:

1. Shallow-water, marine organisms contribute the carbonate particles.
2. Open texture.
3. A uniform fringe of aragonite cement.
4. It is formed in the intertidal zone.

This association is distinctive and is sufficient to identify the material as beachrock.

VII. Recent Geological Mapping in Guadeloupe

The geological map and explanatory notes authored by Saint-Michel¹⁷ provide a very helpful elaboration of the work of Cuvier and Duchassaing. A simplified geological map of the Moule area, based on Saint-Michel's map, is given in Fig. 4. Miocene limestones are the main rock of the island, and these are overlain by a wide variety of Quaternary and Recent sediments. For convenience, the Recent carbonate sands and beachrock have been distinguished from the other surficial sediments.

Saint-Michel mentions the skeletons of Moule and assigns them to beachrock deposits. He describes thin beds of about 12cm thickness which collectively have the appearance of an amphitheatre following the curve of the beach. Beds to the east and west of Moule contain archaeological remains, and these have been examined by Clerc. Three distinct levels have been found. The bottom level contains pottery, jewelry, axes, scrapers and cooking remains. The intermediate level contains lower quality pottery of distinctive design and skeletons with various positions of burial. The upper level contains very crude pottery, stone implements and an abundance of shells.

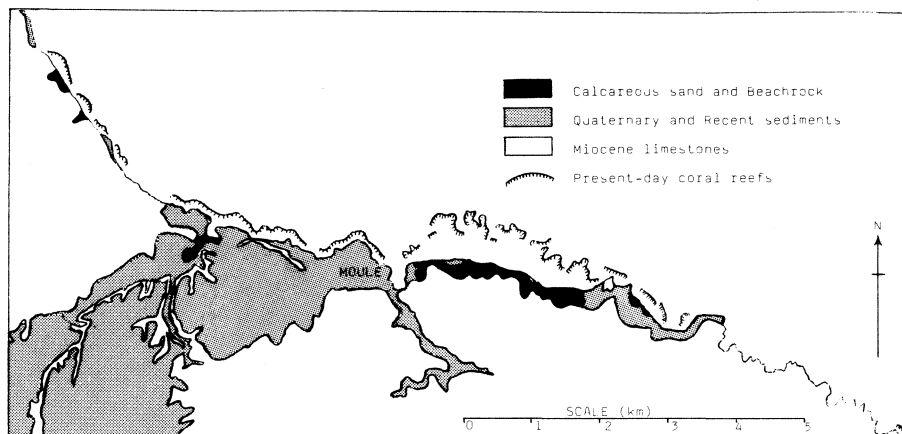


Fig. 4 Simplified geological map of the Moule area, Guadeloupe.

This work consolidates and extends the studies of the last century. Saint-Michel clearly distinguishes between the Miocene limestones and the surficial Recent deposits which contain the archaeological remains and the human skeletons. These latter deposits are unmistakably beachrock.

VIII. Conclusion

This article argues that Cuvier was essentially correct in his interpretation of the fossil skeletons. With the benefit of further knowledge, the limestone can be identified as beachrock which has formed around the bones. The partly lithified skeletons are of archaeological significance and they probably belonged to inhabitants of the island prior to the settlement of Europeans. They have as much bearing on the creation/evolution debate as *Hesperopithecus*¹⁸!

The reason for reviewing their history is not just because of their intrinsic interest. Nor is it merely a case of putting the record straight. It is important to learn from history and to become wiser as a result. The main point to be developed here concerns the methodology which is appropriate to the study of origins. When the skeletons were first discovered, it was possible to interpret them in many different ways — because there were very few facts known to restrict speculation. Following König's careful initial description, Cuvier's approach was to identify factors which constrained and limited the possible interpretations. In particular, characteristics of the rocks were noted which suggested their recent origin. Those who followed were able to extend and reinforce these constraints. The general principle for scholarly activity is to look for constraints on the interpretation of data, so that speculative thought can be checked and replaced by inductive thought.

The danger of speculation is rife in the study of origins today. This is apparent among both evolutionists and creationists — indeed, it is typical human failing! One only has to look at the sensationalism and euphoria that surrounds new fossil hominid finds to realise that speculation rather than scholarly interpretation prevails. Creationists have not been slow to identify this as bad science. When the same characteristics are apparent in creationism, it is not surprising to find it coming under fire¹⁹. The urgent need for today is to debate the issues concerning origins in a well-thought out, well-argued and rigorous way. It can only be for good if scientists have a cautious, careful and questioning attitude. By-passing these characteristics may gain a hearing by the general public, but it will only be temporary and there will be no lasting benefit. Greater attention to methodology, by both creationists and evolutionists, cannot help but improve the value of contemporary debate.

Acknowledgements

Many people have contributed to this study by correspondence, directing my attention to relevant literature, assistance with the analysis of the thin sections, and help with understanding literature in the French language. The writer wishes to thank them all. The valuable assistance of Chris Stringer is particularly acknowledged. Also, Christopher Brown contributed a very useful second opinion on the thin section analysis.

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Continued on page 36

study of design characteristics of man and ape. Whatever similarities in bone structure there may be, there are major design differences between these creatures when taken as a whole. This study shows that much contemporary debate about human evolution is extraordinarily simplistic and fails to address the real issues. One of the major indictments that can be made of modern biology is that it lacks adequate techniques for portraying and investigating the obvious design that is present in living things. This is probably because most modern biology is influenced by evolutionary theory — which is inherently reductionistic. “Design” may be admired — but its study is neglected because it is not recognised as intelligent, purposeful design. The creationist, by contrast, is not at all reluctant to recognise the handiwork of the Designer! In his linkological approach, Duffett is pioneering a new technique which should be of interest not only to creationists but also to all who study living organisms.

The final article is concerned with the first discovery of fossilised human bones, which occurred on the island of Guadeloupe in 1805. The bones were the subject of controversy in the early part of the Nineteenth Century, and also in recent years. David Tyler’s paper is the result of an independent investigation of relevant historical and geological evidences. The conclusions sound a warning note for students of origins. There is much to learn from history and, as a result of this investigation, principles affecting the methodology of historical science are identified.

It is interesting to record the background to the contributions in this symposium. Joachim Scheven gave the Second Biblical Creation Lecture in November 1983, and this lecture is published here. Gerald Duffett gave the substance of his paper at the 1982 BCS “Creation and Origins” study conference. Christoph Bluth spoke on the ‘Cambrian Explosion’ at the 1983 BCS Earth Sciences Group Conference. The contribution of David Watts first appeared as an Earth Sciences Group circular in 1983, and preliminary studies of the Guadeloupe skeletons were also circulated within the Earth Sciences Group in 1983. Readers who wish to follow up ideas contained in the symposium are encouraged to make full use of conferences and related activities. It is only by promoting constructive debate that creationism will develop as an intellectual discipline and will be able to make a worthwhile contribution to the educational world and the academic community.

David J. Tyler.

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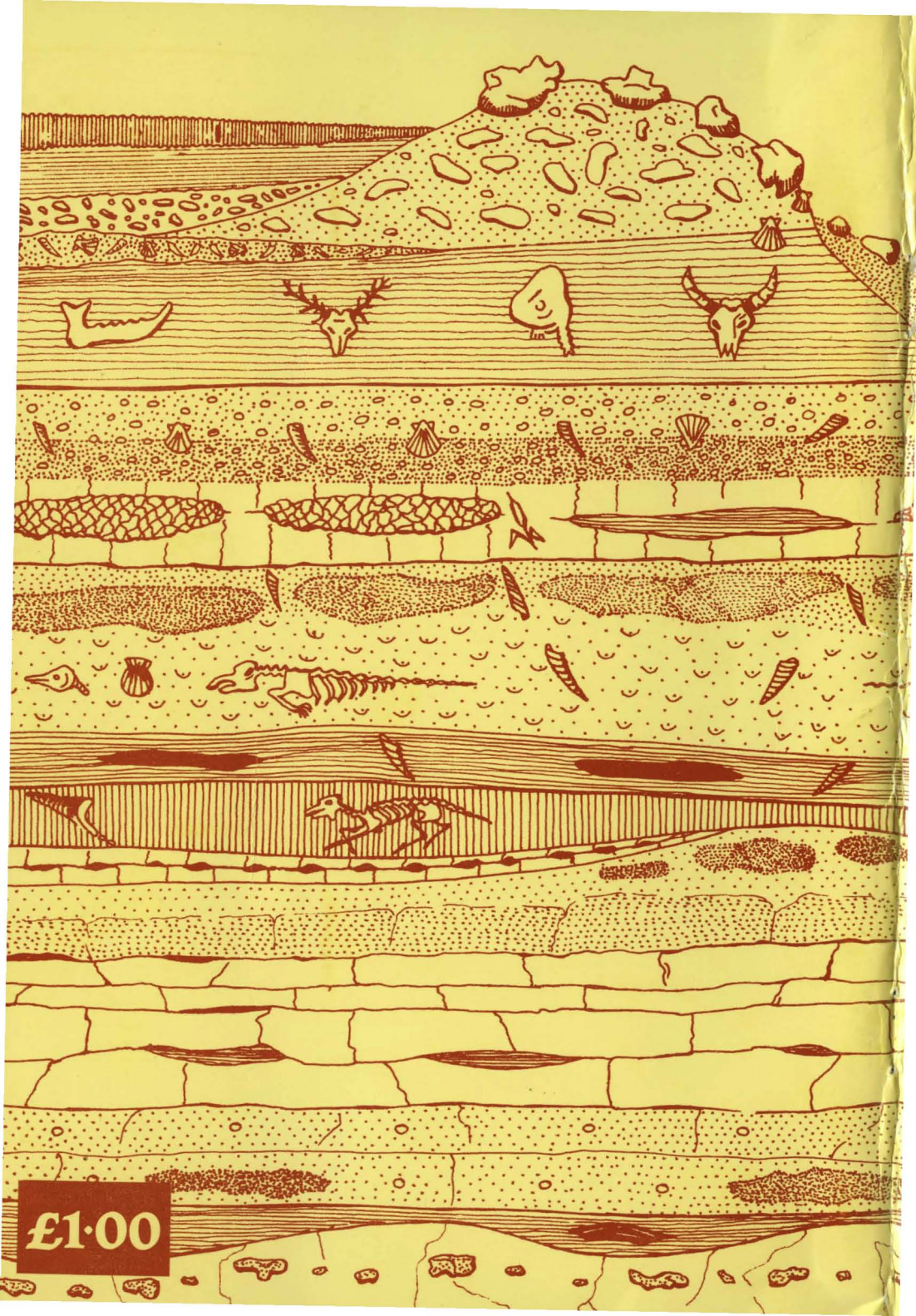
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Cover: *Diagrammatic section of strata based on an illustration by Georges Cuvier. Numerous erosional horizons are present and striking changes in the fossil assemblages. Catastrophists, like Cuvier, interpreted the sequence in terms of a series of major floods within a short time-scale. Uniformitarians, like Darwin, postulated much longer time-scales with sedimentation and erosion taking place at rates comparable to those of today. The succession of faunal assemblages was attributed to changing depositional environments and gradual evolution.*

"We now propose to examine those changes which still take place on our globe, investigating the causes which continue to operate on its surface . . . This portion of the history of the earth is so much the more important, as it has been long considered possible to explain the more ancient revolutions on its surface by means of these still existing causes

But we shall presently see that unfortunately this is not the case in physical history: the thread of operations is here broken, the march of nature is changed, and none of the agents that she now employs were sufficient for the production of her ancient works."

(Georges Cuvier. Essay on the theory of the earth, Third edition. Edinburgh. Blackwood. 1825.)



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